



Macintosh® Computers

Service Guide

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To Apple's On-Site Technicians:

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Apple Service Guide

Macintosh Computers—Introduction



Introduction

The *Apple Service Guide for Macintosh Computers* is the first volume in a series of booklets being developed to help Apple-certified technicians troubleshoot and repair Apple products at their customers' sites. The second release, *Apple Service Guide for Laserwriter Printers*, will be available in April 1991. Subsequent releases will cover networking and communications and Macintosh peripherals.

The *Apple Service Guide for Macintosh Computers* does not replace the *Apple Service Technical Procedures*. The *Apple Service Guide* condenses information found in the *Technical Procedures* and other Service publications, and presents this information in a booklet format that is easy to use and easy to carry. The guide includes *only* information that experienced technicians absolutely need to quickly and reliably service Macintosh computers at the customer's site.

This March 1991 update to the *Apple Service Guide for Macintosh Computers* replaces the original version of the guide (released in August 1990). For this update we made the following additions and revisions:

- Added new software and hardware troubleshooting information, and relocated this information to a new tab (On-Site Troubleshooting) at the front of the guide.
- Added information covering Apple's newest Macintosh computers—the Classic, LC, and IIsi (**see Using the Guide on the next page**).
- Revised information in the Portable tab to cover the new backlit display.
- Located Apple Desktop Bus (ADB) input devices and part numbers in the General Information tab, and added other helpful information to this tab.

Key Features

- Portability—At 5-1/2 by 8 inches and 160 pages, the guide is easy to handle and carry. Just slip the guide into your toolbox or briefcase.
- Ease of use—The plastic spiral binding is tough and enables you to lay the guide open on any available surface. The paper is durable, and its matte finish prevents glare from overhead lighting. The booklet uses tabs, subject/product icons, and color highlighting to help you locate information quickly.
- Presentation of information—Information has been condensed to the extent possible while type size has been kept easily readable. Extensive charts, tables, and graphics present information clearly and concisely.
- No updating required—**This guide will be updated only as necessitated by product changes or new product introductions. Updated versions of the guide, such as this March 1991 release, replace previous versions.**
- Professional appearance—This guide is a high-quality publication that employs the new Apple Service design and uses color to emphasize important information. The cover has a protective coating to resist stains, and the high-resolution printing process enhances the guide's professional appearance and readability.



Apple Service Guide

Macintosh Computers—Introduction

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Using the Guide

****IMPORTANT: When ordering a replacement module or spare part, be sure to check the part number given in the guide against the current price pages in the Apple Service Programs manual. Remember that the Apple Service Guide is not updated on a regular basis.***

Safety Procedures and Practices: You should be completely familiar with all safety procedures and practices before using this guide. Please read this section.

Tab 1—On-Site Troubleshooting: This tab section contains generic troubleshooting information that you might find immediately helpful when you encounter a problem at your customer's site. This information includes:

- Software troubleshooting information, including on-site quick checks, a system crash checklist, and desktop procedures and practices
- Guide to system failures with system failure codes and explanations
- Generic hardware troubleshooting guide and flowchart
- System software installation and system-software compatibility guide

Tabs 2-7: The six Macintosh computer tab sections contain information specific to particular models of the Macintosh computer. The types of information included are:

- Exploded-view drawings of the Macintosh systems
- Alphabetical parts lists (keyed to the exploded view drawings) with part numbers*
- Symptom/cure troubleshooting charts addressing system-specific problems
- System specifications, adjustments, and upgrade procedures

Tab 8—General Information: This tab section contains information that applies to more than one of the Macintosh computers. In this section you can find:

- Internal disk drive information
- 1 MB and 256K SIMM identification tables
- MacTest™ hookups and procedures
- ADB input devices and part numbers
- An index to the special tools required to repair Macintosh computers

Tab 9—Ports and Cables: This tab section includes a table of peripheral cables, Macintosh external connectors, tables of peripheral cable pin-outs, and pinfaces.

Safety

Warnings



WARNING: The compact Macintosh computers contain high voltage and a high-vacuum picture tube. To prevent serious personal injury and property damage, make sure you read and understand the safety precautions on the following pages.



WARNING: Voltage and video adjustments are performed with the power on. Review the following cathode-ray tube (CRT) safety and live adjustment rules before performing these adjustments.



WARNING: Failure to follow the rules for safe CRT discharge could result in serious injury or property damage. For compact Macintoshes, the CRT must be discharged to the ground lug to prevent damage to the logic board.



WARNING: Make sure that you are *not* grounded when:

- You are working on plugged-in equipment
- You are discharging a CRT
- You are working on an unplugged CRT that has not yet been discharged
- You are performing live adjustments



WARNING: Electrostatic discharge (ESD) can cause severe damage to sensitive microcircuits. Macintosh circuit boards contain CMOS components, among the most sensitive chips in use today. CMOS chips, ROMs, and SIMMs are very susceptible to ESD and skin acid damage. To prevent damage to these components, handle them only by the edges.



WARNING: Pulling a disk forcefully from a drive may damage the mechanism. If a disk does not fully eject, refer to "Disk Ejection Problems" in the General Information section.



WARNING: A "dead" lithium battery is considered hazardous waste and has some potential for explosion if improperly handled. Mark the battery "Dead," place it in a zip-lock wrapper and the packaging used to ship the replacement battery, and return the dead battery to Apple, where it will be disposed of following EPA guidelines. Exception: If the battery is physically damaged, do not return it to Apple; dispose of the battery locally according to local ordinances.



Safety

CRT Safety

Ten Rules to CRT Safety

1. **Do not work on a monitor alone.** In case of an accident, having someone nearby—and having someone trained in CPR—could save your life.
2. **Remove all jewelry before performing repairs on a CRT.** Removing these conductors reduces the possibility of electric shock.
3. **Never use a grounding wriststrap or heelstrap or work on a grounded workbench mat when discharging a monitor or when performing live adjustments.** Grounding straps and mats are used to protect sensitive components from ESD damage and should be used only when working on “dead” (un-charged) equipment.
4. **Wear safety goggles when working with a CRT.** The CRT contains a high vacuum. If cracked or broken, the CRT can implode (collapse into itself). To protect your eyes, always wear safety goggles.
5. **Before working inside a monitor, turn off the power and disconnect the AC power cord.** Certain parts of a monitor chassis are hot (electrified) when the monitor is under power. Never work on a monitor under power except when making live adjustments.
6. **Keep one hand in your pocket or behind your back when working on a live monitor.** This reduces the risk of current passing through your body, should you accidentally contact high voltage.
7. **Always discharge the anode before touching anything inside the monitor.** High voltage (up to 12,000 volts DC) can be present on the anode (see Figure) and other components—even when power is off.
8. **Never touch the anode connector or the anode aperture.** When a CRT is replaced, the anode connector is removed, exposing the anode. The anode can retain a charge of several thousand volts even when power is off and can regain some charge even after being discharged.
9. **Do not pick up or handle a CRT by its neck (see Figure).** To prevent an implosion, take every precaution against breaking the tube. Be especially careful with the neck, where the tube is thinnest.
10. **In addition, never touch the following components (see Figure) when adjusting a live Macintosh CRT:**
 - The back of the power switch
 - The yoke wires
 - The anode connector
 - The anode wire
 - The flyback transformer

Safety

CRT Safety

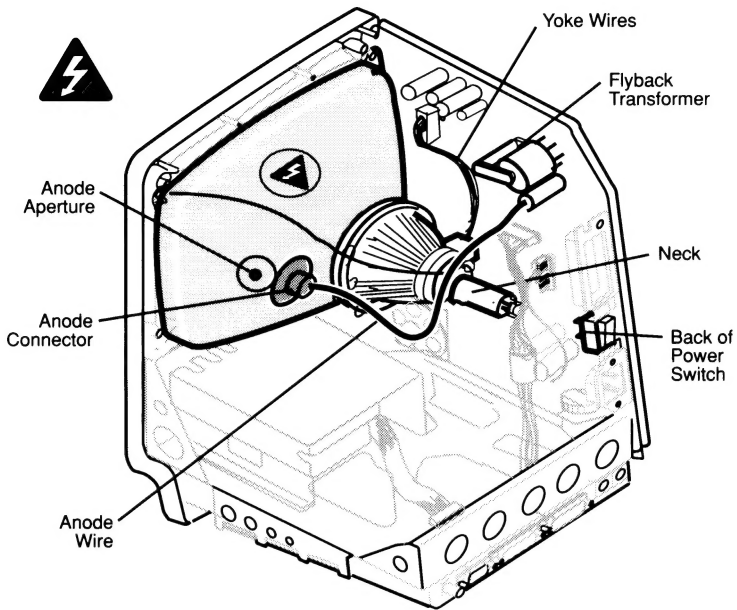


Figure: CRT High-Voltage Areas

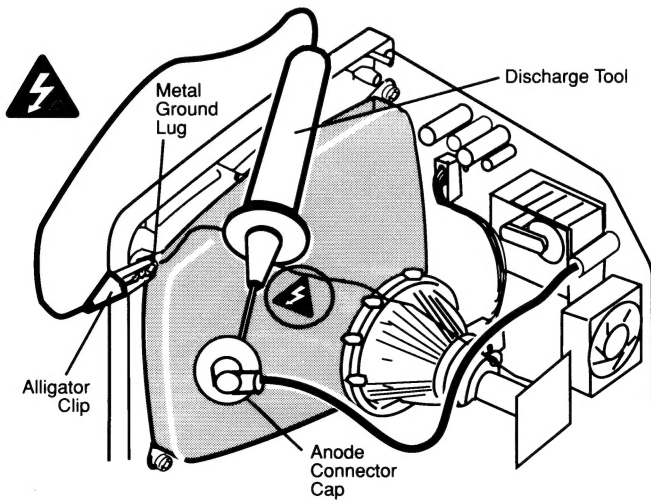


Figure: Discharging the CRT



Safety

Discharging & Devacuuuming the CRT

Use the following procedure to discharge high voltage (12,000 volts) from the picture tube of a compact Macintosh. This procedure and the CRT discharge tool (see **"Special Tools Index" in the General Information section**) can be used to discharge any Macintosh monitor.



WARNING: Discharge the anode to the metal ground lug (see Figure on the previous page). Failure to do so will damage the logic board.

Discharge Procedure

1. Remove your grounding wriststrap and jewelry, and put on safety goggles.
2. Attach the alligator clip on the CRT discharge tool to the metal part of the ground lug (see Figure on the previous page).
3. Put one hand in your pocket or behind your back. With your other hand, insert the tip of the CRT discharge tool under the anode cap (see Figure on the previous page) until it touches the anode ring.
4. Remove the CRT discharge tool. To be sure the CRT is discharged, repeat the discharge procedure (you may want to repeat the procedure using a flat-blade screwdriver with an insulated handle).

Note: The anode can build up voltage over time. To drain off any residual charges, establish an ongoing ground. Fasten one end of an alligator lead to the ground lug and the other end to the anode aperture.

Disposing of the Cathode-Ray Tube (CRT)

To prevent serious injury, follow the procedure described in this section whenever discarding a CRT.



WARNING: To properly dispose of a defective CRT, you must first devacuum the cathode-ray tube. Discarded CRTs that have not been devacuumed may become cracked and implode, injuring anyone who happens to be near.

Materials Required

Thick cardboard box large enough to conceal the CRT
Large, sharp diagonal cutters
Large pliers and duct tape
Safety goggles and gardening gloves
12" x 12" piece of cloth or heavy paper

Devacuuuming Procedure

1. Put on safety goggles.
2. In the side of the box, about six inches from the bottom, cut a hole just large enough to insert the tip of the CRT neck.
3. Place the CRT inside the box with the tip of the neck protruding through the hole, and tape the box flaps down with the duct tape (see Figure on the next page).

Safety

ESD Prevention

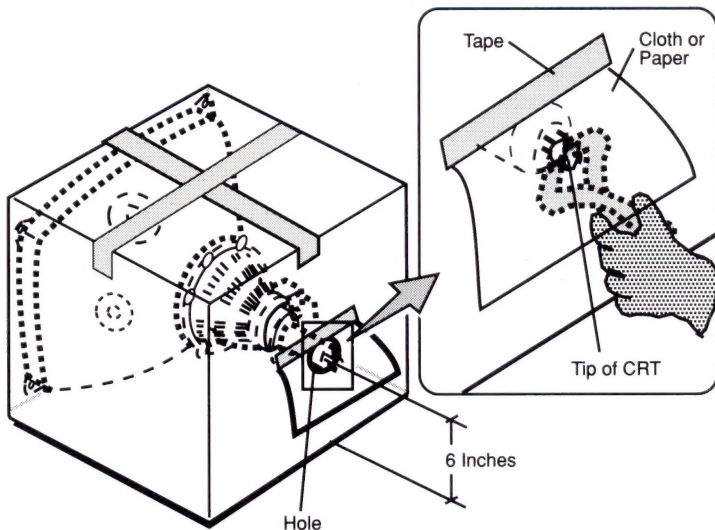


Figure: Devacuuming the CRT



WARNING: Only the very tip of the CRT neck should be protruding through the hole in the box, and the box must not have any other opening.

4. Put on the gloves and, using the diagonal cutters, carefully clip off the connector pins on the end of the CRT neck (**see Figure**).
5. Tape the piece of cloth or paper onto the box so that it forms a veil over the opening, but allows access to the tip of the CRT (**see Figure**). The veil's purpose is to catch bits of glass that may fly during the next step.
6. Make sure no one is standing nearby. Then stand to one side, reach under the veil, and with the large pliers grasp the exposed tip of the CRT. **Look away while you snip off the tip of the CRT.**

Note: You will probably hear a rush of air entering the CRT when the CRT vacuum breaks—but even if you don't, the procedure is complete if the tip of the CRT is clearly broken off.

ESD Prevention

Electrostatic discharge (ESD) can irreparably damage the sensitive CMOS chips and printed circuitry of modern electronic components. Plastic utensils, styrofoam cups, polyester clothing, even the ungrounded touch of your hand carry sufficient electrostatic charges to damage electronic components. Follow the ESD prevention rules and procedure on the next page to prevent ESD damage.



Macintosh Portable

Parts List

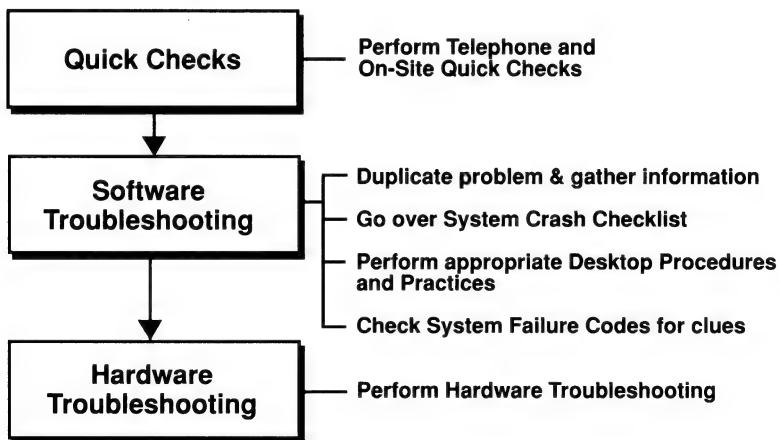
| | |
|---------------------------------------------|------------|
| Sweden, Intl. XP 2400 | S077-0235 |
| Switzerland, Intl. XP 2400 | SD077-0235 |
| United Kingdom, Intl. XP 2400 | B077-0235 |
| External Modem/DAA Cables | |
| Australia | X076-8369 |
| Austria | AU076-8369 |
| Belgium | FN076-8369 |
| Denmark | DK076-8369 |
| Finland | K076-8369 |
| France | F076-8369 |
| Germany | D076-8369 |
| Holland | N076-8369 |
| Ireland | ER076-8369 |
| Italy | T076-8369 |
| Luxembourg | LX076-8369 |
| Norway | H076-8369 |
| Spain | Y076-8369 |
| Sweden/Iceland | S076-8369 |
| Switzerland | SF076-8369 |
| United Kingdom | B076-8369 |
| HDA, 3.5-inch, 40 MB, SCSI | 661-0540 |
| Internal Modem (Cards) | |
| Data Modem 2400 | 661-0468 |
| Intl. XP 2400 Modem* | 661-0465 |
| Intl. XP 2400 Modem, Germany* | D661-0465 |
| MNP Board, Intl. XP 2400 Modem* | 661-0588 |
| Keyboard, Lightweight | |
| British Keyboard | B661-1612 |
| French Keyboard | F661-1612 |
| French Canadian Keyboard | C661-1612 |
| German Keyboard | D661-1612 |
| Italian Keyboard | T661-1612 |
| Spanish Keyboard | E661-1612 |
| Swedish Keyboard | S661-1612 |
| Keyboard, Original | |
| British Keyboard | B661-0476 |
| French Keyboard | F661-0476 |
| French Canadian Keyboard | C661-0476 |
| German Keyboard | D661-0476 |
| Italian Keyboard | T661-0476 |
| Spanish Keyboard | E661-0476 |
| Swedish Keyboard | S661-0476 |
| Keyboard Parts | |
| Keyboard Cover | 815-1059 |
| Keycap Set | 658-7136 |
| Keyswitch Set (10/pk), Original Keyboard | 076-0226 |
| Keyswitch Set (10/pk), Lightweight Keyboard | 076-0387 |
| Locking Keyswitch | 815-1132 |
| Keyboard/Trackball Cable | 590-0507 |
| Logic Board, Static RAM | 661-0470 |
| Logic Board, Pseudostatic RAM | 661-1610 |

***Not available in the United States.**



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On-Site Troubleshooting—Overall Approach



Telephone and On-Site Quick Checks

- ✓ Check the power source and power connection.
- ✓ Check all cables and cable connections.
- ✓ Check the adjustment of all user controls.
- ✓ Check that not more than one system file is on the startup device/disk.
- ✓ Check that the computer system and the system software are compatible (**see the System-Software Configurations table in this section**).
- ✓ Open the computer and verify that all circuit boards, fuses, and chips are secure, clean, and undamaged.



On-Site Troubleshooting

Software Troubleshooting

Information Gathering

When quick checks do not identify the problem, try duplicating the problem (or have your customer duplicate the problem) and gather as much information about the problem as possible.

Note the following:

- Operating condition of the system when the problem occurs (application and version being run; under Finder or Multifinder; system software and version installed; whether networked; system configuration and attached peripherals; INITs, CDEVs, and DAs installed; etc.)
- *Exactly*, what your customer is doing when the problem occurs
- What happens to the system (freezes, crashes, displays error message)
- What your customer has tried to do to fix the problem, and with what results
- If the problem appeared recently, note what your customer recently changed or added to the system

Using this information, perform appropriate solutions from the following System Crash Checklist. If this systematic approach does not fix the problem, your customer probably has a hardware problem (**refer to Hardware Troubleshooting later in this section**).

System Crash Checklist

- ✓ **Check whether the problem is peculiar to one application (try replicating the problem using another application). If the application is at fault, try the following:**

| <u>Possible Problem</u> | <u>Solutions</u> |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program incompatible with MultiFinder | <ol style="list-style-type: none">1. Try booting offending program first.2. Switch to Finder. |
| Program incompatible with system software | <ol style="list-style-type: none">1. Revert to older version of system software.2. Remove program from system.3. Contact vendor about program update. |
| Program corrupted | <ol style="list-style-type: none">1. System crashes can corrupt the program and the system software. Remove the program.2. Reinstall the program and system software from original disks. |
| Insufficient memory to run program | <ol style="list-style-type: none">1. If under MultiFinder, close other applications and restart program. (You may have to restart the system).2. If under MultiFinder, switch to Finder.3. Allocate more memory to application. (Select application, select Get Info from menu bar, and increase allocated memory in the dialog box.) |

On-Site Troubleshooting

Software Troubleshooting



The message
"Application is busy
or missing" displays

1. Make sure application is on drive.
2. Launch application rather than document. If application launches, it is not corrupted. Rebuild your desktop (**see Desktop Procedures and Practices**).

Programs (especially
DAs, INITs, and CDEVs)
conflict

1. If program was added just prior to problem, remove offending program.
2. Remove all DAs, INITs, and CDEVs, and replace one at a time until offender is found (**see Desktop Procedures and Practices**).

- ✓ **Check whether problem is with system software (try booting from a floppy) or with multiple system folders (use Find File under the Apple menu).**

Problem

Solution

Multiple system
folders

- Remove all system folders except folder with the Macintosh icon on it (**see Desktop Procedures and Practices**).

Corrupted system
software

- Replace system software. Use Installer on original system software disks.

Important: When replacing corrupted system software, avoid introducing new problems—always use Installer on the original system software disks. If you remove the System file before running Installer, you will need to replace the fonts and desk accessories on your customer's system. Make copies of your customer's fonts and desk accessories before running Installer. For more information, refer to "Replacing the System File" under Desktop Procedures and Practices later in this tab.

Desktop Procedures and Practices

Identifying and remedying problems that may be software related requires familiarity with basic desktop management procedures and practices. An inappropriately managed desktop could cause the following problems.

Multiple System Folder Problems

- Symptoms: System crashes, unusual error messages, font and DA lists change unexpectedly.
- Occurs: When disks containing system folders are dragged onto system, or system software is loaded without using Installer
- Remedy: Locate and remove all system folders without the Macintosh icon on the folder; also remove any extra System or Finder files.
- Procedure: Boot from known-good system disk, use Find File DA to locate and remove multiple system folders, and reboot computer.



On-Site Troubleshooting

Desktop Procedures and Practices

INIT and CDEV Conflicts

- Symptoms: System crashes and myriad other problems
- Occurs: When INIT or CDEV conflicts with an application on system
- Remedy: Locate and remove all INITs and CDEVs, and then replace them one at a time until the conflict returns.
- Procedure: Place all INITs and CDEVs in a separate folder within system folder (this prevents them from loading when booting system), and return each INIT and CDEV to system folder one at a time. (Renaming an INIT, such as prefixing it with a "Z" so it loads last, sometimes remedies conflict.)

RAM Cache Out-of-Memory Problems

The RAM cache is a Control Panel feature that speeds up the operation of the system. The RAM cache acts as a special RAM buffer between applications and disk drives. From 32K to 768K of the most frequently used blocks of data can be stored in the RAM cache, which can significantly increase speed within an application and will cause applications to launch from and return to the Finder more quickly. Memory problems can occur when the RAM cache is set too high.

- Symptoms: Insufficient memory problems, applications won't run, degraded system performance, ID=28 system bombs in systems configured with 1 MB or less of memory
- Occurs: When RAM cache is set too high (available system memory is insufficient to run program)
- Remedy: Switch off RAM cache, or reduce amount of memory allocated to RAM cache.
- Procedure: Open Control Panel and set RAM cache down as desired, and then reboot system.

Rebuilding the Desktop / Slow Finder

- Symptoms: Finder cannot locate applications that are on disk drive, or Finder is slow.
- Occurs: When disk is overloaded with applications and icons, or applications contain excessive number of file comments
- Remedy: Rebuild desktop file (which erases comments from Get Info comment box of all applications on drive).
- Procedure: Hold down <Option> and <Command> keys while booting, or while quitting application if operating in Finder. Click **Yes** in resulting dialog box (to rebuild the desktop).

Resetting Corrupted Parameter RAM

When an application crashes it sometimes executes code that corrupts parameter RAM on Macintosh II systems running system software prior to release 5.0. PRAM contains information (a default value) required by the Macintosh operating system (OS) to start up from an internal SCSI drive, as well as other OS information.

- Symptoms: Macintosh II will not boot from internal SCSI drive.
- Remedy: Reset parameter RAM to its default values.
- Procedure: Hold down <Shift>, <Option>, and <Command> keys while open-

On-Site Troubleshooting

Desktop Procedures and Practices



ing Control Panel DA. Click **Yes** in resulting dialog box to zap PRAM, which resets some user options to their default values.

Restoring Damaged Boot Blocks

- Symptoms: System does not recognize or boot from hard disk drive.
Occurs: When startup instructions (boot blocks) on the hard drive are damaged, or the hard disk driver is damaged
Remedy: Replace the hard disk driver.
Procedure: Boot the computer from a startup disk that contains an appropriate hard disk setup program. (For Apple HDAs, use the Apple HDSC Setup program found on a Macintosh System Utilities disk.) Install or update the hard disk driver on the hard drive.

Replacing the System File

- Symptoms: Minor, intermittent problems accessing disks, printing, system startup, or launching programs
Occurs: When System file or related files are damaged, often from disk writing errors
Remedy: Replace the System file using the Installer. To ensure that the problem is corrected, you should remove the entire System Folder before using the Installer.
Procedure: Copy all **non-Apple** system folder files from the System Folder to another folder on the desktop (**see below**). Then drag the System Folder into the Trash and start up the Installer program from the original system software disk. Place the non-Apple files in the new System Folder. (**For information about using the Installer, refer to Replacing/Installing System Software later in this section.**)

| | | | | |
|---------------------------------|-------------------|----------------|-------------|--------|
| Apple Files: (System Folder) | Access Privileges | Key Layout | MultiFinder | Finder |
| | Backgrounder | AppleShare | Keyboard | Mouse |
| | Clipboard File | DA Handler | Responder | Color |
| | Startup Device | Easy Access | Monitors | System |
| | Scrapbook File | Finder Startup | General | Sound |

Removing and Preventing Viruses

- Symptoms: Unexplained system crashes; corrupted or disappearing files
Occurs: By using a disk or program that is infected by a virus; often contracted from shareware found on electronic bulletin boards
Remedy: Use an antivirus program to eradicate the virus, and practice virus prevention in the future.
Procedure: Boot the computer from a startup disk that contains an antivirus application and launch the eradication program. There are several effective antivirus programs, including Disinfectant by John Norstad, Interferon and Virex by Robert Woodhead, and SAM from Symantec.
Prevention: Many of the antivirus applications include programs for screening inserted disks for known viruses—use them! Also, master disks should be locked; applications can be protected by locking them using the Get Info box.



On-Site Troubleshooting

System Failures

System Failures—Introduction

You are experiencing a serious system failure if your screen fills with dots, strange patterns, or garbage characters, or your Mac emits sounds similar to muted gunfire. Other system failures, often called crashes, can result in a hung system (for instance, your cursor is frozen in place on the screen) or a system bomb with an error message and ID number. Often your only alternative is to hit the reset button on the programmer's switch or restart the computer. However, if you do encounter an alert box containing an error message and code, you should note the error code and check it against one of the tables on the following pages.

You can encounter three types of Macintosh system failure codes: **boot ("Sad Mac") failures**, **system failures**, and **application failures**. Explanations of these error codes can be found in the following tables. Whenever possible, these explanations include suggestions that may help isolate the problem. Further suggestions are given below on this page.

If these suggestions do not help and you have tried the software troubleshooting recommendations on the previous pages of this section, refer to Startup Problems—Flowcharts later in this section. You probably have a hardware problem.

About Sad Mac, System, and Application Error Codes

These codes and explanations (called *Meanings* in the table) can help lead you to the source of the problem. If the Meaning given in the Error Code tables does not recommend a solution, or the solution does not fix the problem, keep in mind that serious system failures can be caused by:

- Software problems (damaged program or system files; incompatible INIT files)
- Data problems (damaged or incomplete data files; corrupted PRAM)
- Damaged boot blocks
- Hardware problems

Possible Solutions:

To rectify system problems, try rebuilding the desktop and restarting your system. If this does not rectify the problem, use another startup disk and try:

1. Removing INITs from your system (especially INITs added recently)
2. Checking the disk for a virus
3. Replacing the System file and Finder using Installer
4. Replacing the application with a fresh copy from the master disk
5. Resetting the parameter RAM
6. Restoring the boot blocks

For instructions on performing these procedures, refer to "Desktop Procedures and Practices" earlier in this section.

On-Site Troubleshooting

System Failure Codes



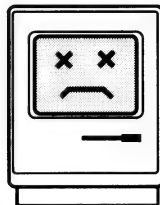
Sad Mac Error Codes

If a Macintosh Plus fails at startup, you will see a "Sad Mac" icon (see Figure) and a six-digit error code. If a Macintosh SE fails at startup, the problem is usually bad RAM and you will see a 16-digit SIMM error code (see the Macintosh SE tab). If other Macintoshes fail at startup, you will hear a series of error chords (see Startup Problems—Flowchart 2).

Sad Mac error codes can mean that the computer has failed the internal diagnostic tests and you have a hardware problem. Sad Mac codes can also have less serious causes, outlined below.

Other Sad Mac possibilities:

1. A non-System disk in the default drive.
2. A bad boot disk.
3. An incompatible system file on the boot disk.
4. No Finder on the boot disk.
5. The programmer's switch is stuck.



Sad Mac Error Codes

| Code | Meaning | Code | Meaning |
|-----------|-----------------------------------------------|--------|------------------------------------------------------|
| 01_ _ _ _ | ROM test failure | 0F0006 | Overflow trap - TRAPV instruction ² |
| 02_ _ _ _ | RAM test failure (bus subtest) ¹ | 0F0007 | Privilege violation ² |
| 03_ _ _ _ | RAM test failure (byte write) ¹ | 0F0008 | Trace trap ² |
| 04_ _ _ _ | RAM test failure (mod3 test) ¹ | 0F0009 | Trap dispatcher error ² |
| 05_ _ _ _ | RAM failure (address uniqueness) ¹ | 0F000A | Line 1111 trap ² |
| 0F0001 | Bus error ² | 0F000B | Other trap ² |
| 0F0002 | Address error ² | 0F000C | Unimplemented trap executed ² |
| 0F0003 | Illegal instruction ² | 0F000D | Interrupt button, programmer's switch ^{2,3} |
| 0F0004 | Zero divide ² | 0F0064 | Bad System file ^{2,4} |
| 0F0005 | Check trap - CHK instruction ² | 0F0065 | Bad Finder ² |

¹ The first two digits indicate a RAM failure; the last four digits identify (in hexadecimal) the suspected bad chip. Try removing the SIMMs, rubbing the connection area with a pencil eraser to improve the connection, and replacing the SIMMs. If this doesn't help, isolate the bad SIMM (refer to Flowchart 3, SIMM Verification).

² "0F" indicates a software error—the startup device was spinning before the failure occurred. Try: (1) Restarting the Macintosh with the <Option> and <Command> keys held down (rebuilding the desktop); or (2) Replacing the System file.

³ Check the interrupt button—it could be stuck.

⁴ The startup disk may be missing the System file.



On-Site Troubleshooting

System Failure Codes

System Error Codes

The two-digit system error code is located in the lower-right corner of the dialog box that informs you "A Serious System Error Has Occurred." **Refer to the System and Application Error Codes tables** that follow for a list of these codes and an explanation of their meaning.

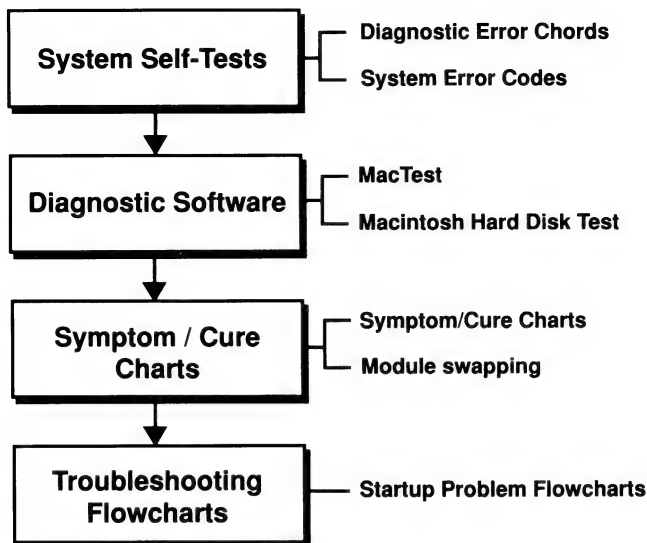
| System Error Codes | | |
|--------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Code | Type | Meaning |
| 01 | Bus error | Program attempts to access an invalid memory location. Often caused by corrupt application. Replace application with known-good copy or upgraded version. If replacing software does not help, then probably a hardware problem. |
| 02 | Address error | A corrupt application has placed program information in an odd vs. even address location. Install a known-good copy or upgraded version of the application. |
| 03 | Illegal instruction | Processor receives an instruction that does not match its internal list of instructions. |
| 04 | Zero divide | Programmer told processor to divide by 0 (mathematically impossible). |
| 05 | Range check error | Index out of range (for example, programmer declares an array of five elements and searches for the sixth). |
| 06 | Overflow | Computer attempts to store a number that is too large for the allotted space. |
| 07 | Privilege violation | 68000 is running in "user" mode and attempts to execute a command that requires "supervisor" mode. |
| 08 | Trace mode error | 68000 chip can trace itself for debugging; can interfere with normal execution. |
| 09 | Line 1010 trap | Processor cannot execute a ROM call accessed via a trap with a hexadecimal "A" code. Often caused by a corrupt application. Replace application with a known-good copy or upgraded version. |
| 10 | Line 1111 trap | An incorrect ROM call. |
| 11 | Exception error | A miscellaneous hardware error not covered elsewhere. |
| 12 | Unimplemented core routine | Occurs when program attempts to execute a ROM call via an undefined trap. |
| 13 | Uninstalled interrupt | Needed routines are not available or the interrupt switch is pressed when a runtime debugger is not present. |
| 14 | I/O core error | Error in the file system or the device manager system. |

On-Site Troubleshooting

Hardware Troubleshooting



Isolating a Hardware Problem



- **System Self-Tests**—Start up the customer's system, listen for diagnostic error chords (**see Startup Problems—Flowchart 2, in this section**), and look for system error codes (**refer to System Failure Codes in this section**).
- **Diagnostic Software**—If the system passes the self tests but the problem persists, try running the appropriate *MacTest* program (**refer to the General Information tab for MacTest versions, hookups, and procedures**). If you suspect a hard disk problem, you should also run the *Macintosh Hard Disk Test* program.
- **Symptom Charts/Module Swapping**—If the customer's system (or *MacTest*) will not boot or *MacTest* fails to find the problem, **refer to Symptom/Cure Charts in the system tab that covers your customer's Macintosh**. If you think you recognize the problem and you have the necessary replacement module with you, try module swapping.
- **Troubleshooting Flowcharts**—If the customer's system (or *MacTest*) will not boot or *MacTest* fails to find the problem and the problem is not clearly defined or not listed in the Symptom/Cure Charts, **refer to the Startup Problems—Flowcharts at the end of this section**. These flowcharts present a step-by-step procedure for isolating the problem.



On-Site Troubleshooting

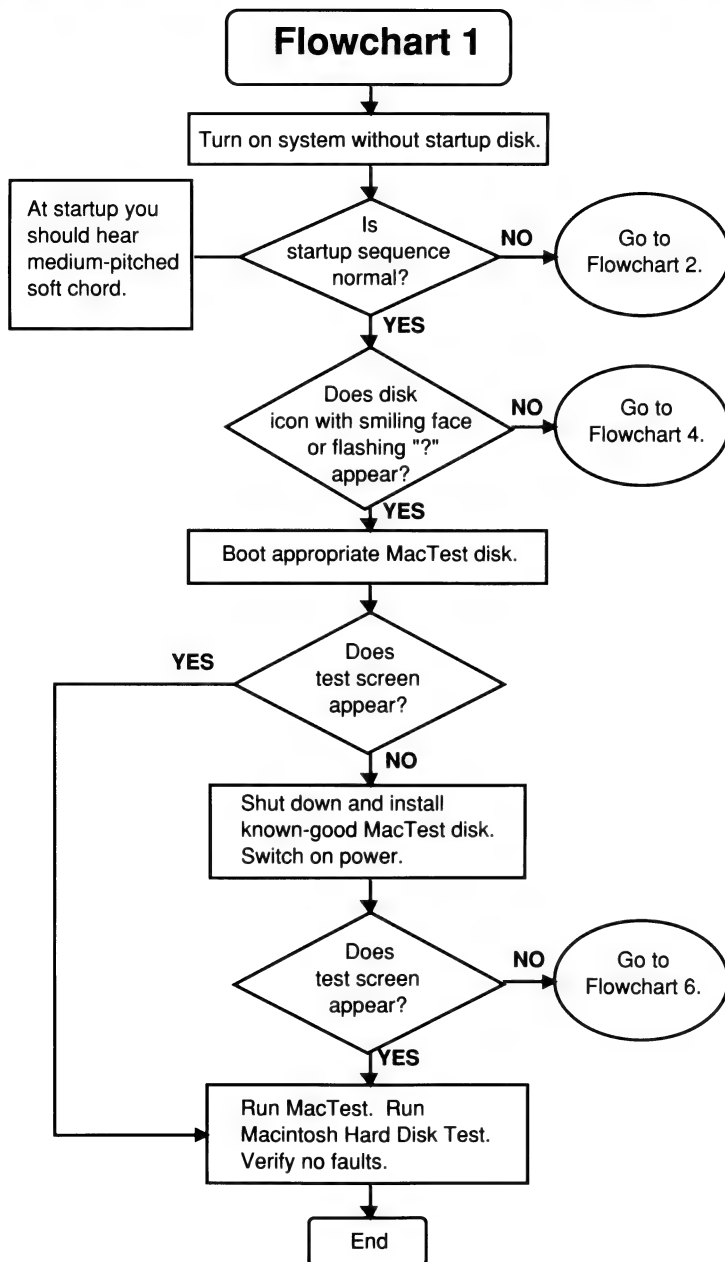
Hardware Troubleshooting

Hardware Troubleshooting Guidelines

1. Use only known-good test equipment and diagnostic programs.
2. The troubleshooting tools are designed to test a system in its minimum configuration. Disconnect external peripherals and remove all NuBus cards. After verifying that the computer is fully operational, reinstall/reconnect and test each expansion card and external device one at a time.
3. When using the Symptom/Cure Charts, always try the solutions one at a time, in sequence, until you fix the problem. If the problem remains, reinstall the original module before trying the next solution.
4. The hardware troubleshooting flowcharts verify each repair action by looping back to the start (Flowchart 1). If a repair does not fix the problem, reinstall the original module, return to the flowblock of origin, and perform the next repair action on the list.
5. When instructed to replace the **logic board only**, place the customer's SIMMs on the replacement logic board. Be sure to use the SIMM removal tool (**see Special Tools Index under General Information**). To test the customer's SIMMs, **refer to Flowchart 3, SIMM Verification, in this section**.
6. Always verify that the original problem has been fixed. To verify that the original problem is fixed, duplicate the conditions under which it appeared. To verify that there are no additional faults, run *MacTest*.

On-Site Troubleshooting

Startup Problems—Flowcharts





On-Site Troubleshooting

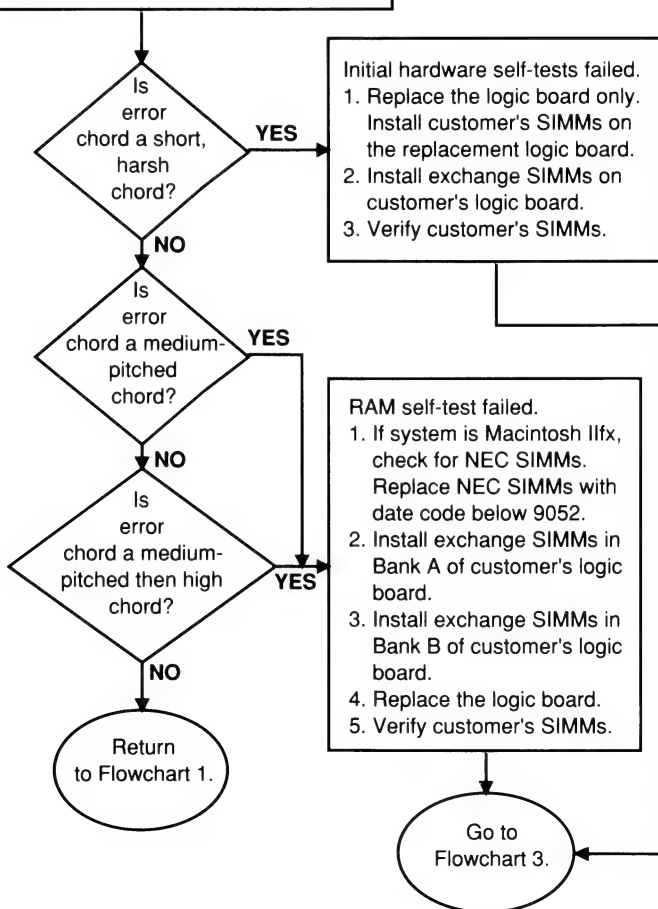
Startup Problems—Flowcharts

Flowchart 2 (Startup & Error Chords)

If an error is encountered at startup you will hear:

- First, a medium pitched, soft startup chord (normal)
- Second, an error chord (not normal)
- Third, a test monitor chord (4 chords, low to high)

Pay close attention to the error (second) chord.

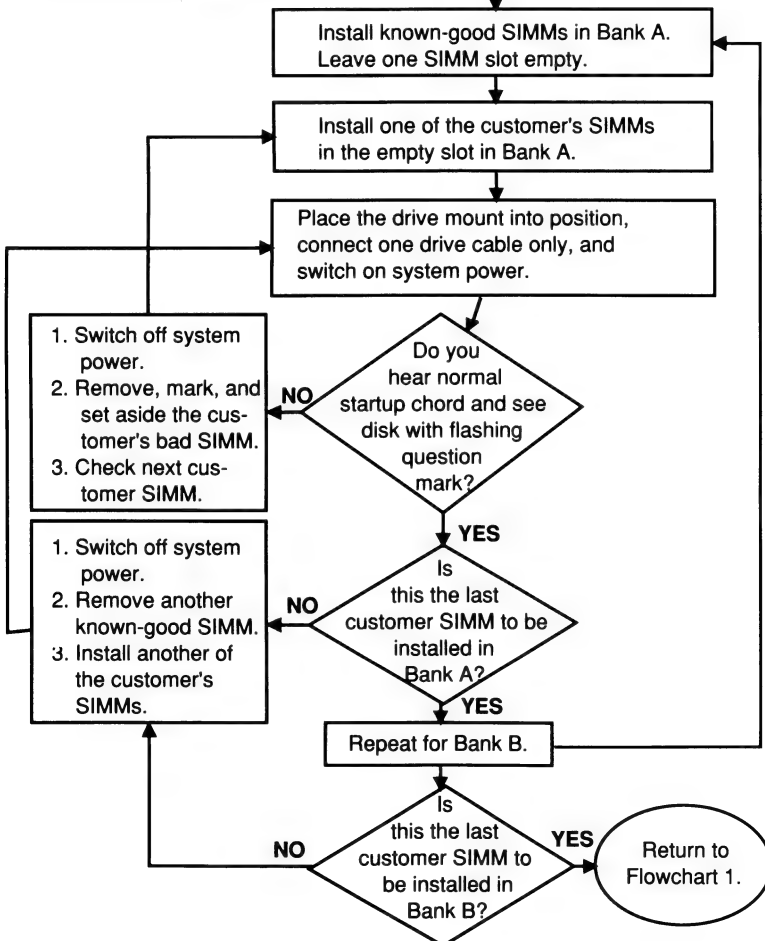




Flowchart 3 (SIMM Verification)

Note: When verifying SIMMs, you need:

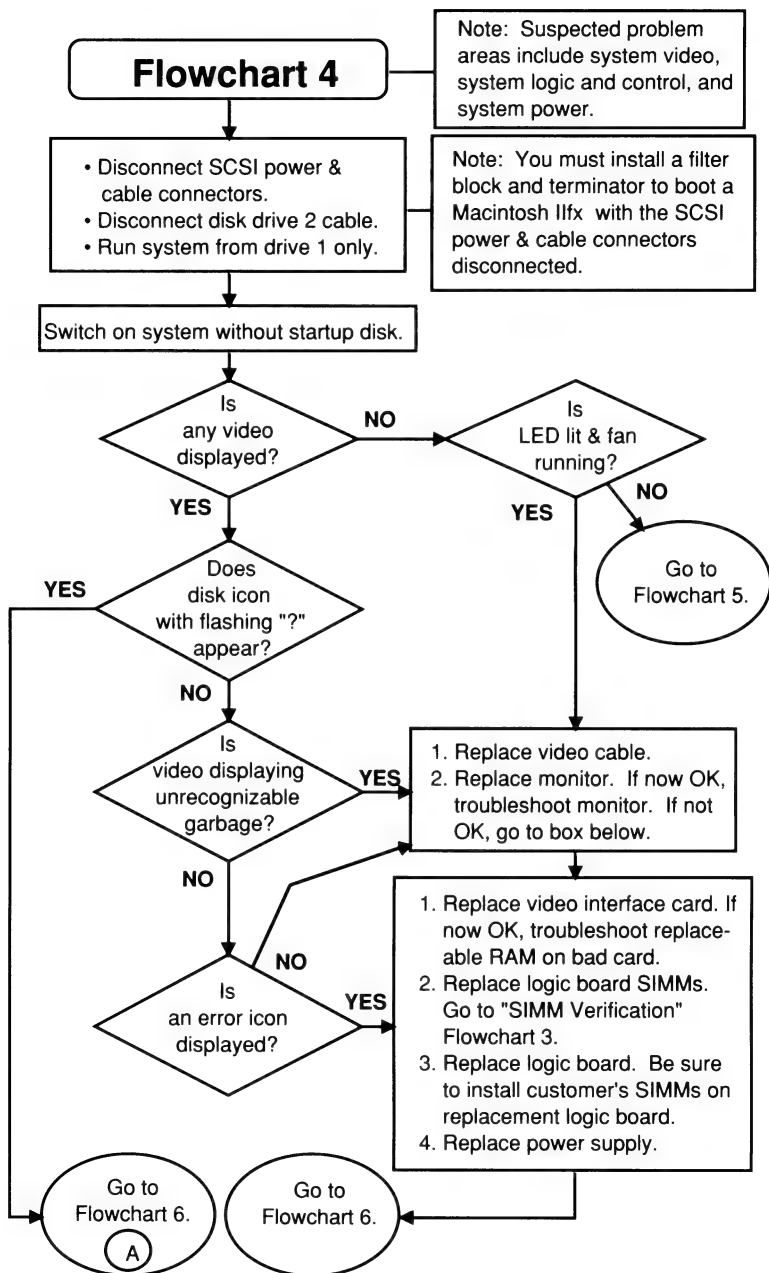
- As many known-good SIMMs as SIMM slots in each bank of the customer's logic board.
- Known-good SIMMs the same size as the customer's SIMMs.





On-Site Troubleshooting

Startup Problems—Flowcharts



On-Site Troubleshooting

Startup Problems—Flowcharts



Flowchart 5

Note: Suspected problem areas include system power, system logic and control, and system video.

Turn off system power, remove the top cover, and check the lithium batteries with a voltmeter. The batteries must read :

- 2.8V or higher - Macintosh Classic, SE & SE/30, LC, IIsi, IIfx, and IICI
- 3.2V or higher - Macintosh II/IIfx/IIfx

Are batteries OK?

YES

1. Replace power supply.
2. Replace logic board. Be sure to install customer's SIMMs on replacement logic board.

Go to Flowchart 7.

NO

Replace bad batteries and continue procedure.

Is LED lit & fan running?

NO

YES

Does disk icon with smiling face or flashing "?" appear?

NO

YES

Go to Flowchart 7.

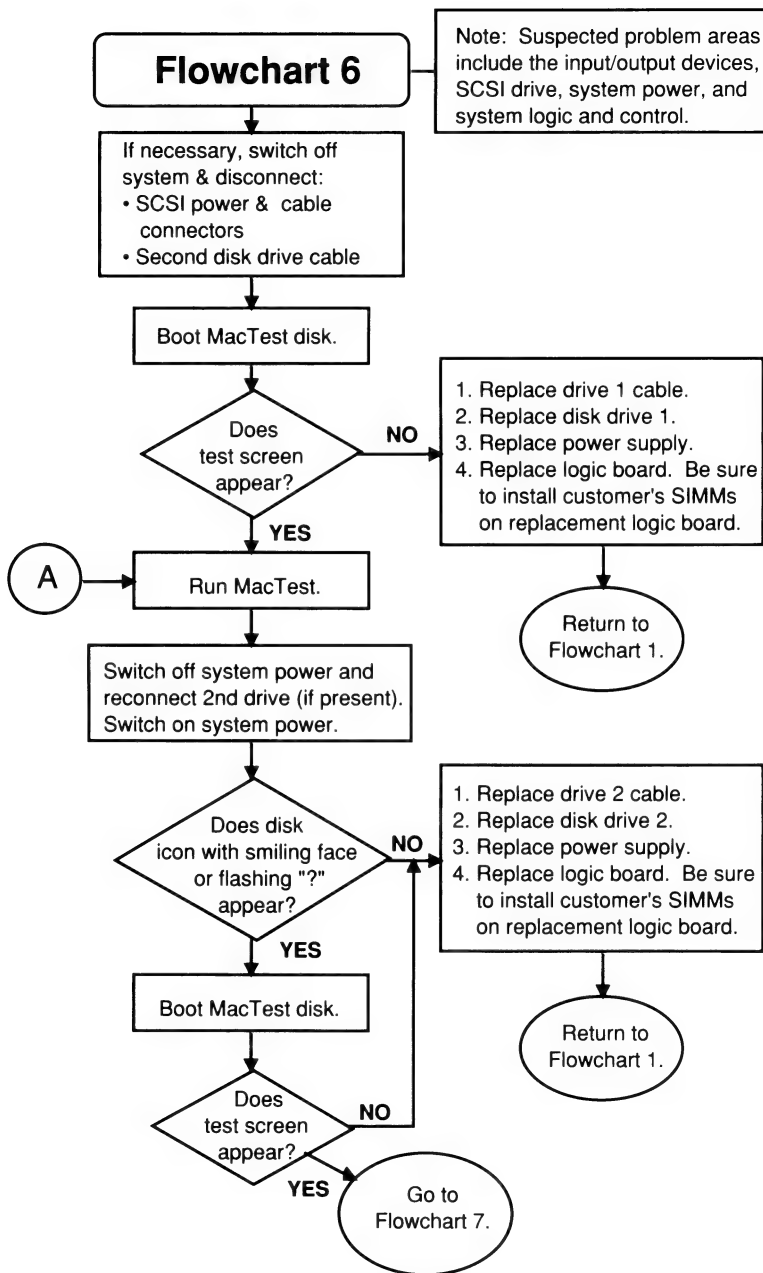
1. Replace video cable.
2. Replace monitor. If now OK, troubleshoot monitor.
3. Replace video interface card. If now OK, troubleshoot replaceable RAM on bad card.
4. Replace logic board SIMMs. Go to "SIMM Verification" Flowchart 3.
5. Replace logic board. Be sure to install customer's SIMMs on replacement logic board.
6. Replace power supply.

Return to Flowchart 1.



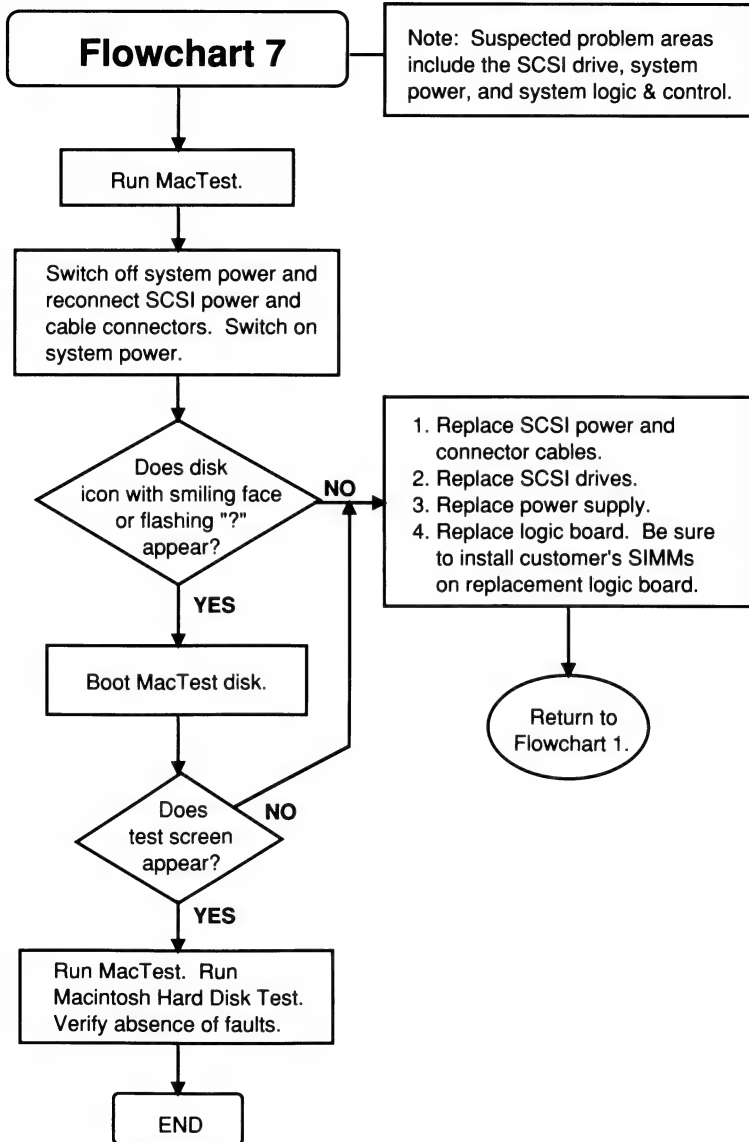
On-Site Troubleshooting

Startup Problems—Flowcharts



On-Site Troubleshooting

Startup Problems—Flowcharts





On-Site Troubleshooting

Replacing/Installing System Software

You may need to install system software at the customer's site. Some systems—currently those with 80 or 160 MB internal SCSI drives—are shipped with the operating system already installed on the hard drive. Replacing these SCSI drives requires reinstalling system software.

Installing System Software Versions 6.0.2 to 6.0.4

Requirements

- System Software (ver. 6.0.2, 6.0.3, or 6.0.4)
(System & Printing Tools, Utilities 1 & 2)

Installation

1. Insert the System Tools disk in a floppy drive, and switch on the computer.
2. Double-click on the System Tools disk icon, the Setup Folder, and Installer.
3. Select the disk on which you want to install system software. Click **Drive** until you see this disk.
4. Select your computer type and click **Install**.
5. When finished, quit the Installer and reboot.

Installing System Software Version 6.0.5 or Later

The Installer has Easy Install and Customize options. Easy Install automatically installs system and printer software that is appropriate for the destination disk and your computer. **You must use the Customize option to install AppleShare® workstation software.** The Customize option can also be used to create a boot disk with the minimal software required for any Macintosh system.

Requirements

- System Software (ver. 6.0.5 or later)
(System & Printing Tools, Utilities 1 & 2, & HyperCard®)

Installation

1. Insert the System Tools disk in a floppy drive and switch on the computer.
 2. Double-click on the System Tools disk icon and on the Installer.
 3. When the welcome screen appears, click **OK**.
 4. Select the disk on which you want to install system software. Click **Switch Disk** until you see this disk.
- Easy Install
5. Click **Install**. The appropriate software is automatically installed.
 6. When finished, quit the Installer and reboot.
- Customize
5. Click **Customize**. Then select (click or shift-click) the software you wish to install from the options listed in the scrollable window.
 6. Click **Install**. The selected software is then installed.
 7. When finished, quit the Installer and reboot.

On-Site Troubleshooting

System-Software Compatibility



System-Software Configurations

| Macintosh Model | Recommended Versions | Acceptable Versions |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 128K | System 2.0/Finder 4.1 | |
| 512K | System 3.2/Finder 5.3 | |
| 512Ke | System 3.2/Finder 5.3 System 3.3/Finder 5.4 System 3.4/Finder 5.4 | System 4.0/Finder 5.4 System 4.1/Finder 5.5 |
| Plus | System 6.0.2/Finder 6.1 System 6.0.3/Finder 6.1 System 6.0.4/Finder 6.1 System 6.0.5/Finder 6.1 System 6.0.7/Finder 6.1 | System 3.2/Finder 5.3 System 3.3/Finder 5.4 System 4.0/Finder 5.4 System 4.1/Finder 5.5 System 4.2/Finder 6.0 |
| SE | System 6.0.2/Finder 6.1 System 6.0.3/Finder 6.1 System 6.0.4/Finder 6.1 System 6.0.5/Finder 6.1 System 6.0.7/Finder 6.1 | System 4.0/Finder 5.4 System 4.1/Finder 5.5 System 4.2/Finder 6.0 |
| II | System 6.0.2/Finder 6.1 System 6.0.3/Finder 6.1 System 6.0.4/Finder 6.1 System 6.0.5/Finder 6.1 System 6.0.7/Finder 6.1 | System 4.1/Finder 5.5 System 4.2/Finder 6.0 |
| SE/30 IIfx, IIfx | System 6.0.3/Finder 6.1 System 6.0.4/Finder 6.1 System 6.0.5/Finder 6.1 System 6.0.7/Finder 6.1 | |
| IIfx | System 6.0.4/Finder 6.1 System 6.0.5/Finder 6.1 System 6.0.7/Finder 6.1 | |
| Portable | System 6.0.5/Finder 6.1 System 6.0.7/Finder 6.1 | System 6.0.4/Finder 6.1 |
| IIfx | System 6.0.5/Finder 6.1 System 6.0.7/Finder 6.1 | |
| Classic, LC, IIfx | System 6.0.7/Finder 6.1 | |

Macintosh and Macintosh Plus

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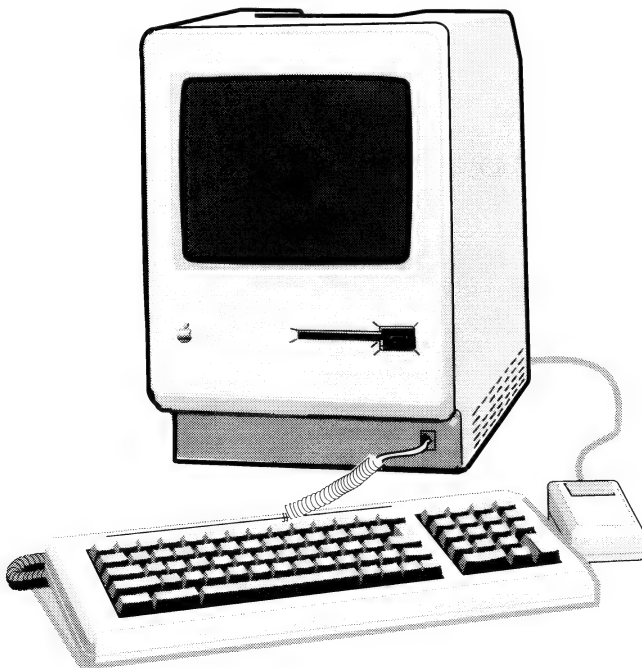


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128K, 512K,
& Plus

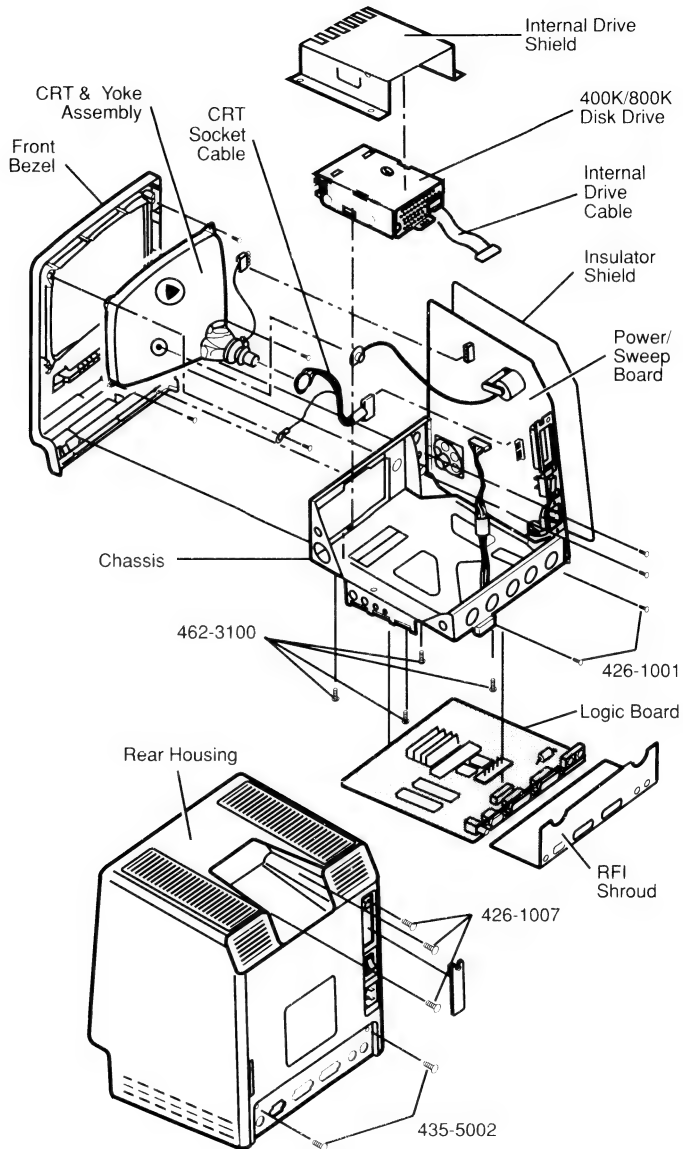




Macintosh and Macintosh Plus

Exploded View

128K, 512K,
& Plus



Macintosh and Macintosh Plus

Parts List



Macintosh only

| | |
|----------------------------------------------------------------------|-----------|
| Disk Drive, Apple 3.5, 400K Mechanism | 661-76156 |
| Internal Drive Cable, 3-1/2" (red stripe – also 800K Mechanism)* . . | 590-0167 |
| Internal Drive Shield | 805-0765 |
| Front Bezel, Macintosh, Beige | 810-0373 |
| Logo Label (Bezel) | 825-0547 |
| Keyboard Parts (for obsolete Keyboard 661-9654): | |
| Keyboard Bottom Case | 815-0754 |
| Keyboard Top Case | 815-0728 |
| Keycap Set | 658-7039 |
| Logic Board, 128K Main | 661-96152 |
| Logic Board, 512K Main | 661-96236 |
| Battery, Alkaline, 4.5 V | 742-0003 |
| RFI Shroud, Macintosh | 805-0577 |
| ROM, High, Rev. B, Macintosh with 400K Floppy Disk Drive | 661-0220 |
| ROM, Low, Rev. B, Macintosh with 400K Floppy Disk Drive | 661-0221 |
| ROM, High, Macintosh with 800K Floppy Drive | 661-0632 |
| ROM, Low, Macintosh with 800K Floppy Drive | 661-0633 |
| Rear Housing with Label | 630-5139 |
| Agency Approval Label | 825-4018 |
| Agency Approval Label, 512K | 825-1014 |
| Logo Label (Housing) | 825-0613 |
| Macintosh Battery Door, Beige | 815-0938 |
| Macintosh Foot, Platinum (beige foot not available) | 865-0051 |
| Macintosh Label | 825-0742 |
| Macintosh Signature 128K Label | 825-1064 |
| Macintosh Signature 512K Label | 825-1065 |

Macintosh Plus only

| | |
|-------------------------------------------------|-----------|
| Cable, Peripheral Adapter, Smoke | 699-0430 |
| Front Bezel, Macintosh Plus, Beige | 810-0379 |
| Front Bezel, Macintosh Plus, Platinum | 810-0385 |
| Ground Clip, Macintosh Plus | 805-0910 |
| Logo Label (Bezel) | 825-0547 |
| Keyboard, Platinum (with cable) | 661-0416 |
| Keyboard, Platinum, French | F661-0416 |
| Keyboard, Platinum, French Canadian | C661-0416 |
| Keyboard, Platinum, German | D661-0416 |
| Keyboard, Platinum, Italian | T661-0416 |
| Keyboard, Platinum, Spanish | E661-0416 |
| Keyboard Parts (for Keyboard 661-0416): | |
| Bottom Cover, Platinum | 815-0984 |
| Cable, Keyboard/Keypad, Smoke | 590-0170 |
| Keycap Set, Smoke | 658-5190 |
| Keyswitch, Alps Alpha Lock | 705-0077 |
| Keyswitch, Alps Long-Stem | 705-0070 |
| Keyswitch, Mitsumi | 705-0104 |
| Keyswitch, Mitsumi Locking | 705-0044 |
| Top Cover, Platinum | 815-0983 |

*Refer to "Internal Drive Cables" in General Information.

continued...



Macintosh and Macintosh Plus

Parts List

| | |
|------------------------------------------------------------------|----------|
| Logic Board (w/o RAM; replaces 661-0321) | 661-0525 |
| Battery, Alkaline, 4.5 V | 742-0003 |
| Resistor, 150 Ohms, 1/4 W, $\pm 5\%$ | 101-4151 |
| RFI Shroud, Macintosh Plus | 805-5047 |
| ROM, High | 661-0632 |
| ROM, Low | 661-0633 |
| SIMM, 256K, 120 ns | 661-0402 |
| SIMM, 256K, DIP, 120 ns | 661-0494 |
| SIMM, 1 MB, 120 ns | 661-0403 |
| Mouse, Apple, Platinum | 661-0400 |
| Rear Housing, Beige | 630-5211 |
| Agency Approval Label, Beige | 825-1254 |
| Battery Door, Beige | 815-0938 |
| Reset/Interrupt Switch, Beige | 815-0737 |
| Rear Housing, Platinum | 630-5235 |
| Agency Approval Label, Platinum | 825-1345 |
| Battery Door, Platinum | 815-0971 |
| Reset/Interrupt Switch, Smoke | 815-0763 |
| Rear Housing, Beige and Platinum—Parts for Both: | |
| Ground Clip, Upper | 805-0575 |
| Macintosh Foot, Platinum (beige foot not available) | 865-0051 |
| Screw, Tap, 8-32 x .625, Torx, Blk Zinc Oxide (main case bottom) | 435-5002 |
| Screw, Tap, M 4.22 x 1.41 x 16, Torx, Zinc (main case top) | 426-1007 |

Macintosh & Macintosh Plus

| | |
|----------------------------------------------------------------|-----------|
| Chassis | 805-0766 |
| Screw, M 3 x .5 x 6 | 462-3100 |
| Screw, Tap, 6-32 x .375, Chassis Grounding | 490-0002 |
| CRT and Yoke Assembly | 076-0103 |
| CRT Socket Cable | 590-0160 |
| Mylar Washer | 725-0018 |
| Screw, Tap, M 4.22 x 1.41 x 13 (CRT & Chassis) | 426-1001 |
| Disk Drive, Apple 3.5, 800K Mechanism (512K Enhanced and Plus) | 661-0345 |
| Internal Drive Cable, 3-1/2" (yellow stripe) | 590-0437 |
| Internal Drive Shield (512K Enhanced and Plus) | 805-0217 |
| Packing Disk, 2-sided (for transporting) | 003-0003 |
| Keyboard, Beige (replacing 661-96154) | 661-0322 |
| Bottom Cover, Beige | 815-0937 |
| Cable, Keyboard/Keypad, Beige | 590-0144 |
| Keycap Set, Beige | 658-5186 |
| Keyswitch, Alps Alpha Lock | 705-0077 |
| Keyswitch, Alps Long-Stem | 705-0070 |
| Keyswitch, Mitsumi | 705-0104 |
| Keyswitch, Mitsumi Locking | 705-0044 |
| Screw, Tap 2.20 x 6.25 (Keyboard Case) | 430-1025 |
| Top Cover, Beige | 815-0936 |
| Mouse, Macintosh, Beige | 661-96155 |
| Mouseball Retainer | 815-0409 |
| Rubber-Coated Mouseball | 699-8001 |
| Power Cable, Beige | 590-0138 |
| Power Cable, Smoke | 590-0131 |
| Power Supply, 110 V, Beige | 661-0461 |

Macintosh and Macintosh Plus

Parts List & Power/Sweep Volt. Adj.



| | |
|-----------------------------------------|-----------|
| Power Supply, 110 V, Platinum | 661-0462 |
| Power/Sweep Board, 220 V | 661-76214 |
| Brightness Knob, Smoke | 865-0029 |
| Cable, Power Supply to Logic | 590-0511 |
| Fuse, Power Supply, Int'l, 1.6 A 250 V | 740-0060 |
| Fuse, Power Supply, U.S., 2.5 A 250 V | 740-0300 |
| Ground Clip, Lower | 805-0576 |
| Insulator Shield (Back of Power Supply) | 725-0011 |
| Screw, M 2.9 x 10 | 470-2101 |
| Service Packaging, 800K/1.4 MB Drives | 602-0210 |

Power/Sweep Voltage Adjustment

You must verify correct voltages whenever the logic board or power/sweep board is replaced. If the voltages are outside specified tolerances, perform the voltage and video adjustments.

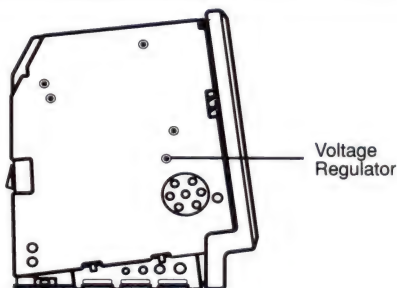


Figure: Voltage Adjustment Control



WARNING: Voltage adjustments are performed with the power on. Review the CRT safety and live adjustment rules before performing this procedure.



WARNING: When using the voltmeter, make sure the banana plug test probes do not short to one another, which will damage the Macintosh. Pull the insulating rubber hoods over the test probes.

Voltage Adjustment Procedure

1. Switch off power, disconnect the power cord, and disconnect any peripheral devices.
2. Connect the **voltage test cable** to the **external disk drive port** at the rear of the computer.
3. Use the voltmeter and **orange** test cable as follows:
 - a. Connect the **black** voltmeter lead between the ground terminal of the voltmeter and the computer chassis.
 - b. Connect the **orange** test cable lead (12-volt lead) to the voltage input terminal on the voltmeter.

continued...



Macintosh and Macintosh Plus CRT Yoke Adjustments

- c. Connect the power cord and switch on the computer. The voltage reading must be from **11.90 to 12.75 volts**.
- d. If not within tolerance, use the plastic alignment tool to adjust the voltage regulator on the power/sweep board (**see Figure on previous page**).
4. Switch off computer power and disconnect the orange lead.
5. Connect the **red** test cable lead (5-volt lead) to the voltage input terminal and switch on computer. If the voltage reading is not **5 volts ($\pm .15V$)**, adjust the voltage regulator (**see Figure on previous page**).
6. Repeat steps to verify correct voltages. Replace the power/sweep board if correct voltages cannot be attained.

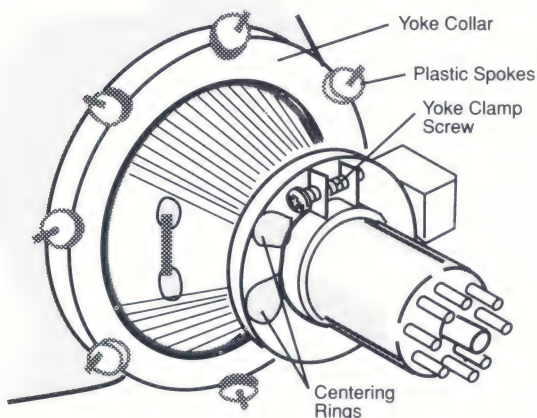


Figure: CRT Adjustment Controls



WARNING: Video adjustments are performed with the power on. Review the CRT safety rules before performing these procedures.

Tilt Adjustment Procedure

1. Remove the cover and discharge the CRT. Turn the computer so that the back is facing you, and place a mirror in front of the CRT screen.
2. Loosen the **yoke clamp screw** two or three turns (**see Figure**).
3. Connect the power cord and switch the power on.

Macintosh and Macintosh Plus

CRT Yoke Adjustments



4. Place one hand behind your back, and with your other hand grasp only the plastic spokes of the **yoke collar (see Figure)**. Rotate the **yoke collar** until the top and bottom edges of the picture appear parallel with the top and bottom edges of the bezel. **(Do not move the magnets, which are preset by the manufacturer and should not be adjusted.)**
5. Switch the power off, unplug the computer, and discharge the CRT.
6. Hold the **yoke collar** in position and tighten the **yoke clamp screw** so that the **yoke collar** will not slip **(see Figure)**. Don't overtighten.
7. Connect the power cord and switch the power on to verify that the adjustment is still correct.
8. Replace the cover.

Centering Ring Adjustment Procedure

1. Remove the cover and discharge the CRT. Turn the computer so that the back is facing you, and place a mirror in front of the CRT screen.
2. Locate the two **centering rings** on the yoke assembly **(see Figure on previous page)**. If a bonding material is holding the rings in place, use a small matte knife to break the bonding.
3. Connect the power cord and switch the power on.
4. Rotate each ring about half a turn and observe the effect on the screen. The adjustment of the **centering rings** determines whether the picture is centered or offset to one side.
5. Center the picture by first holding the **front ring** steady and moving the **rear ring**, then holding the **rear ring** steady and moving the **front ring**.
6. When the screen is properly centered, switch the power off, unplug the computer, and replace the cover.



Macintosh and Macintosh Plus

Video Adjustments

Perform the video adjustments whenever the CRT or power/sweep board is replaced.

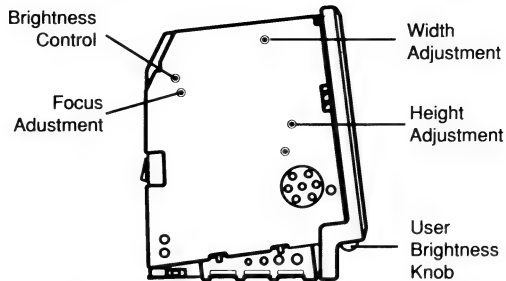


Figure: Video Adjustment Controls



WARNING: Video adjustments are performed with the power on. Review the CRT safety rules before performing these procedures.

Brightness and Contrast Adjustment Procedure

1. Remove the cover and discharge the CRT. Turn the computer so that the back is facing you and place a mirror in front of the CRT screen.
2. Connect the power cord and switch the power on.
3. Turn the **user brightness knob (see Figure)** fully clockwise.
4. Using the alignment tool, turn the **brightness control (see Figure)** fully counterclockwise so that white lines are visible on the screen. Then turn the **brightness control** clockwise until the white lines just disappear.
5. Turn the **user brightness knob** slightly counterclockwise to achieve the ideal brightness and contrast adjustment.

Size Adjustment Procedure

1. Use the plastic alignment tool to adjust the **width adjustment (see Figure)** until the raster is approximately 7 inches wide.
2. Use the alignment tool to adjust the **height adjustment (see Figure)** until the raster is approximately 4.7 inches high.

Focus Adjustment Procedure

1. Launch any application or document to fill the screen with information.
2. Turn the **focus adjustment (see Figure)** fully clockwise. Then turn the **focus adjustment** back (counterclockwise) one-eighth of a turn and adjust for best overall focus.
3. Close the application, switch off computer power, and replace the cover.



Video Problems

Solutions

No video, but audio tone is present and drive operates

1. Turn contrast control fully clockwise.
2. Check video cable.
3. Replace neck cable.
4. Replace power/sweep board.
5. Replace logic board.

Screen is bright and audio is present, but no video information is present

1. Replace power/sweep board.
2. Replace logic board.

Drive Problems

Solutions

Disk ejects; display shows disk icon with blinking "X"

1. Replace bad disk.
2. Replace disk drive cable.
3. Replace disk drive.
4. Replace logic board.

Unable to insert disk all the way

1. Power off the system and hold mouse button down while switching power back on to ensure eject cycle has been completed.
2. Replace disk drive.

Drive will not eject disk

1. Hold down <Shift> and <Command> keys and press 1 (for the internal drive) or 2 (for external drive).
2. Pull down File menu and select **Eject**. Attempt this two or three times.
3. Eject disk manually by pushing opened paper clip into hole beside drive slot.
4. Replace disk drive.

Will not read disks on internal or external drive

1. Replace bad disk.
2. Replace disk drive cable.
3. Replace Mylar RFI shield.
4. Replace disk drive.
5. Verify ROMs on logic board.
6. Replace logic board.

Audio tone sounds at power on, video is present, but drive does not operate

1. Replace disk drive cable.
2. Replace disk drive.
3. Replace logic board.

Drive continually ejects disk

1. Check disk drive cable. **See the compatibility table under Disk Drives—Internal Drive Cables in General Information.**
2. Replace disk drive.

continued...



Macintosh and Macintosh Plus

Symptom/Cure Chart

Drive Problems (continued)

Solutions

Disk drive runs continuously

1. Replace bad disk.
2. Replace disk drive cable.
3. Replace disk drive.
4. Replace logic board.

400K drive will not boot

1. If logic board has Rev. A ROMs and drive stepper motor is serial number F518 or higher, upgrade to Rev. B ROMs.
2. Replace disk drive.

Peripheral Problems

Solutions

Cursor does not move

1. Connect mouse.
2. Replace mouse.
3. Replace logic board.

Cursor moves but clicking mouse produces no response

1. Replace mouse.
2. Replace logic board.

No response to any key on the keyboard

1. Replace keyboard cable.
2. Replace keyboard.
3. Replace logic board.

No response from a particular key

1. Replace keyswitch.
2. Replace keyboard.
3. Replace logic board.

Known-good ImageWriter, or ImageWriter II will not print

1. Make sure Chooser and Control Panel are set correctly.
2. Replace software with known-good software.
3. Replace printer interface cable.
4. Replace logic board.

Known-good LaserWriter will not print

1. Make sure Chooser and Control Panel are set correctly.
2. Replace software with known-good software.
3. Refer to *Networks* tab in *Apple Service Technical Procedures*.

Macintosh and Macintosh Plus

Symptom/Cure Chart



Miscellaneous Problems

Solutions

When turned on, Macintosh Plus continuously beeps and tries to power up

1. Check power/sweep voltage.
2. Replace power/sweep board, logic board, and internal drive; then turn on Macintosh Plus.
Replacing only the power/sweep board may damage the new power/sweep board.

Clicking or chirping sound

1. Connect logic board cable.
2. Perform voltage adjustment.
3. Replace power/sweep board.
4. Replace logic board.

Smoke/odor issues from computer

- Replace power/sweep board.

No video, no audio tone, and no drive operation

1. Connect power cord.
2. Turn power on.
3. Replace power cord.
4. Check fuse.
5. Replace power/sweep board.
6. Replace logic board.

MacTest displays 128K/512K when 1 MB Macintosh Plus is tested

- Replace Macintosh Plus logic board.

When developer's switch is installed, Macintosh Plus resets intermittently

- Remove switch and file the end 1/16 of an inch.

Macintosh Plus hangs on startup

- Check ROMs. If ROMs 342-0341-A or B (ROM HI) and 342-0342-A (ROM LO) are installed on logic board and peripheral device is connected to SCSI port, turn on peripheral device before switching on computer.

Macintosh 512K enhanced has two RFI shrouds

- Some machines have two RFI shrouds installed. Replace two RFI shrouds with one RFI shroud.



Macintosh and Macintosh Plus

Specifications

Macintosh/Macintosh Plus Specifications

| | |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68000; 32-bit internal data bus 7.83 MHz clock speed |
| Memory | 128K, 512K Plus: 1 MB, expandable to 4 MB 128K ROM standard |
| Video Display | 9-inch (diagonal) screen; 512-by-342-pixel bit-mapped display |
| Interfaces | Two RS-232/RS-422 serial ports (DB-9 on the Macintosh 128K/512K; Mini DIN-8 on the Macintosh Plus) One SCSI parallel port (Macintosh Plus only) One DB-19 external disk drive port One sound port |
| Internal Storage | Built-in 3.5-inch 400K drive for 128K and 512K Built-in 3.5-inch 800K drive for 512K enhanced and Plus (uses 3.5-inch hard-case floppy disks—either double-sided with 800K capacity, or single-sided with 400K capacity) |
| Sound | Four-voice sound with 8-bit digital/analog conversion using 22 KHz sampling rate |
| Clock/Calendar | CMOS custom chip with 4.5-volt user- replaceable battery backup (includes 256 bytes of memory that remembers system parameters even with the machine turned off) |
| Electrical | Line voltage: 105 to 125 volts AC Frequency: 50 to 60 Hz Maximum power: 60 watts |

Macintosh and Macintosh Plus

Logic Board Identification

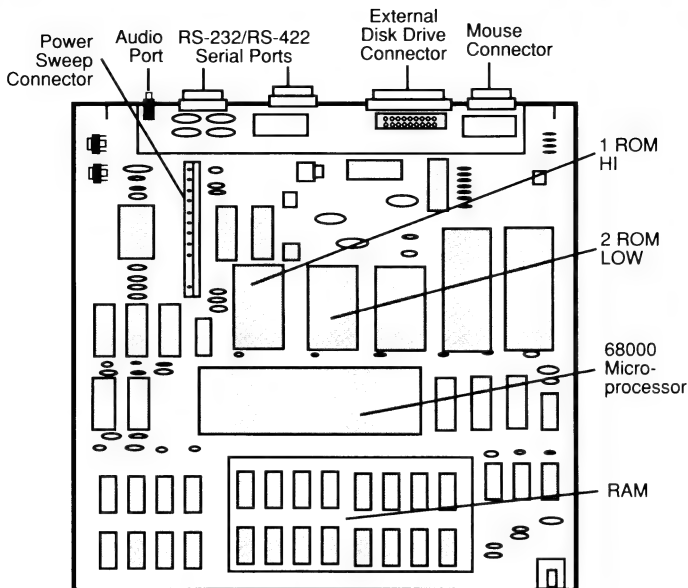
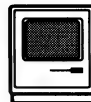


Figure: Macintosh 128K/512K Logic Board

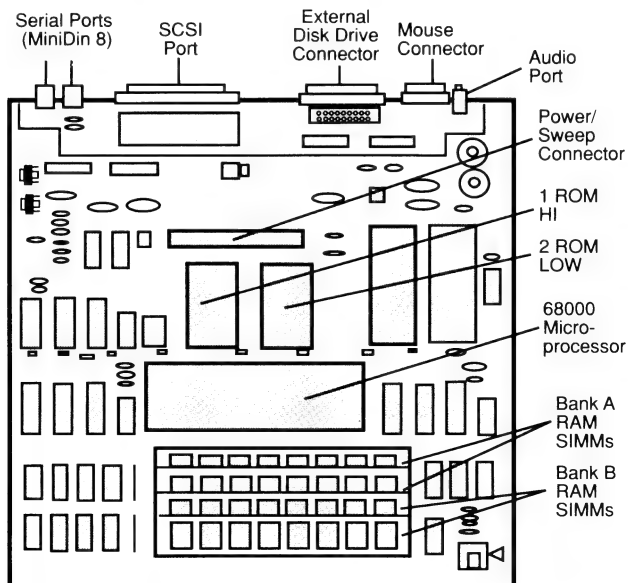


Figure: Macintosh Plus 1 MB Logic Board



Macintosh and Macintosh Plus

Macintosh Plus Kits

Things to Remember

1. Before working inside the Macintosh, discharge the CRT to the metal ground lug. Failure to do so can result in damage to the logic and power/sweep boards (**see Discharging and Disposing of the CRT under Safety**). Use the CRT discharge tool (**see Special Tools Index under General Information**).
2. After installing the Disk Drive Kit, return the old ROMs and the 400K disk drive to Apple.
3. After installing the Logic Board Kit, return the 128/512K logic board, the old RFI shield, and the old cover to Apple.

800K Disk Drive Kit Installation Procedure

1. Remove the cover and the RFI shield, and discharge the CRT to the metal ground lug.
2. Remove the logic board. Using an IC extractor, remove the two ROMs installed at locations D5 and D8.
3. Install the two **new** ROMs in the appropriate locations on the logic board. The notch at the end of each ROM should face the front of the machine.

| <u>ROM</u> | <u>P/N</u> | <u>Location</u> |
|------------|------------|-----------------|
| HI | 342-0341 | D5 |
| LOW | 342-0342 | D8 |

4. Remove the internal disk drive.
5. Install the logic board and the new 800K internal disk drive.
6. Install the RFI shield and the cover.

Logic Board Kit Installation Procedure

1. Remove the cover and the RFI shield, and discharge the CRT to the metal ground lug.
2. Remove the **128K/512K** logic board. Using an IC extractor, remove the two ROMs installed at locations D5 and D8.
3. Install the ROMs in the appropriate locations on the new **1 MB** logic board. The notch at the end of each ROM should face the front of the machine.

| <u>ROM</u> | <u>P/N</u> | <u>Location</u> |
|------------|------------|-----------------|
| HI | 342-0341 | D5 |
| LOW | 342-0342 | D8 |

4. Install the new **1 MB** logic board, the new RFI shield, and the new cover.

Macintosh and Macintosh Plus

Macintosh Plus Memory Upgrade



The Macintosh and Macintosh Plus require 150-ns (or faster) SIMMs. RAM speed is indicated by the -xx number after the manufacturer's part number (-15 indicates a 150-ns SIMM). SIMMs are available in 256K and 1 MB RAM sizes. Adding memory to a Macintosh and Macintosh Plus requires that you configure the logic board as shown in the Figure and chart below.

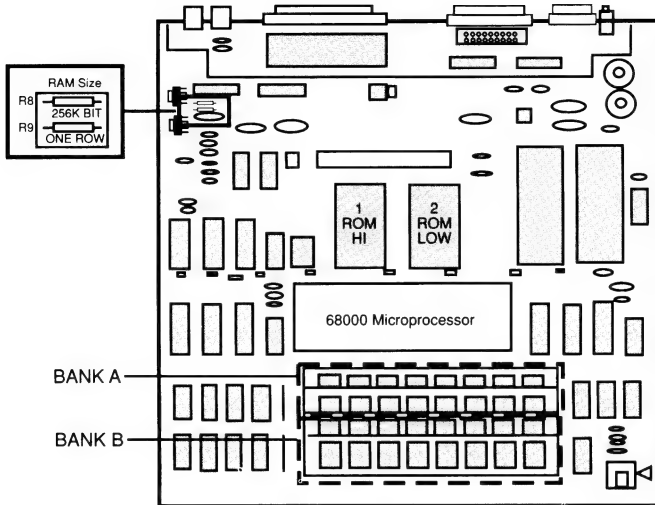


Figure: Macintosh Plus 1 MB Logic Board

Upgrade Procedure

1. Clip or install the needed resistor (see chart below).
2. Remove/install the SIMMs as indicated in the chart below. Use the SIMM removal tool (see **Special Tools Index** under **General Information**).

| RAM | Resistors | SIMMs |
|--------|----------------------------|------------------------------------------------|
| 1 MB | R8 installed R9 removed | 2—256K SIMMs (Bank A) 2—256K SIMMs (Bank B) |
| 2.5 MB | R8 removed R9 removed | 2—1 MB SIMMs (Bank A) 2—256K SIMMs (Bank B) |
| 4 MB | R8 removed R9 removed | 2—1 MB SIMMs (Bank A) 2—1 MB SIMMs (Bank B) |



Macintosh and Macintosh Plus ROM Upgrade & ROM Compatibility

To be compatible with the current 400K disk drive stepper motor, the 128K/512K Macintosh should have ROM HI 342-0220-B at location D5, and ROM LOW 342-0221-B at location D8. If these ROMs are not installed, upgrade the logic board by replacing the boot ROMs as shown below.

ROM Upgrade Procedure

1. Power off the Macintosh, remove the power cord and cover, and discharge the CRT. Use the CRT discharge tool (**see Special Tools Index under General Information**).



WARNING: Failure to follow the rules for safe CRT discharge could result in serious injury or property damage. The Macintosh CRT must be discharged to the ground lug to prevent damage to the logic board.

2. Put on your grounding wriststrap and place the Macintosh on a grounded workbench pad.
3. Remove the logic board and verify that old ROMs are installed.
4. Using an IC extractor, remove the old ROMs.
5. Install the new ROMs in the appropriate location—ROM HI (P/N 342-0220-B) at location D5, ROM LOW (P/N 342-0221-B) at location D8. The notch at the end of each ROM should face the front of the machine on installation.
6. Replace the Macintosh logic board and the cover.
7. Run *MacTest* to verify correct operation.

ROM Compatibility for 800K Drives

The 512K logic board (P/N 661-96236) is shipped with a high-boot ROM (P/N 342-0220) and a low-boot ROM (P/N 342-0221) that support only the 400K disk drive. When the 512K logic board is used to replace a defective 512K enhanced logic board or a defective 512K logic board with a 800K disk drive, you must replace the ROMs on the replacement 512K logic board with ROMs from the customer's logic board. The customer's ROMs, which support 800K disk drive systems, will have part numbers 342-0341 (high-boot ROM) and 342-0342 (low-boot ROM).

Also, newer Macintosh 512K enhanced and Macintosh Plus systems and the 800K disk drive upgrade kit have revised high-boot and low-boot ROMs that correct the SCSI device problems of older ROMs. The newer ROMs are compatible with 512K systems, but you cannot mix old and new ROMs. This list gives the part number and the version letter of the old and new ROMs:

| | Old ROMs | New ROMs |
|-------------------|--------------------------|------------|
| High Boot: | 342-0341-A 342-0341-B | 342-0341-C |
| Low Boot: | 342-0342-A | 342-0342-B |

Macintosh SE, SE/30, and Classic

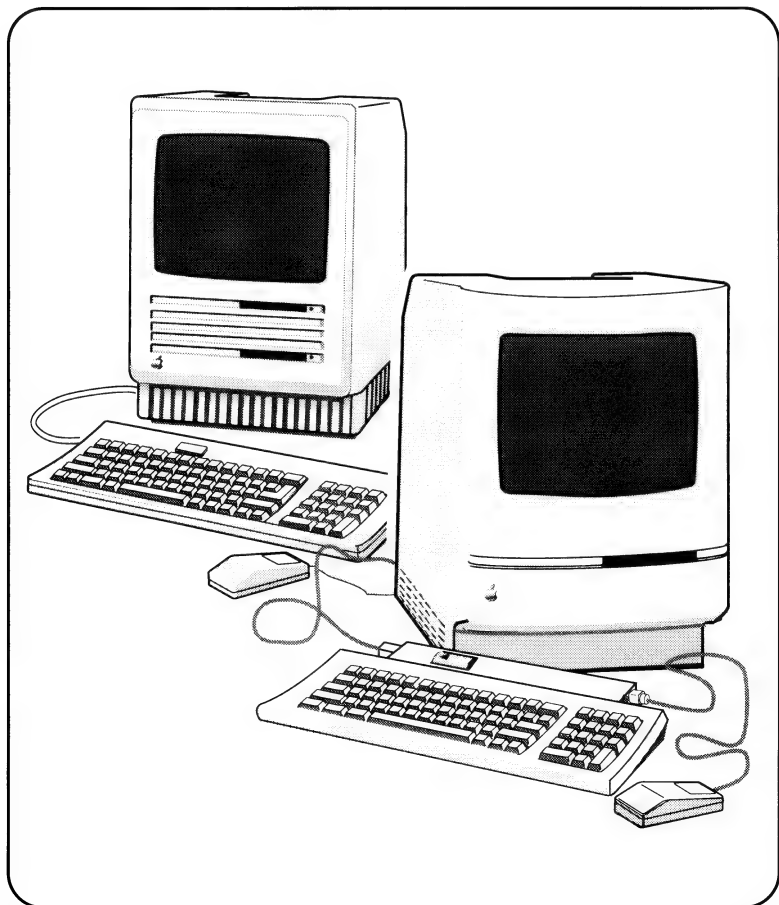
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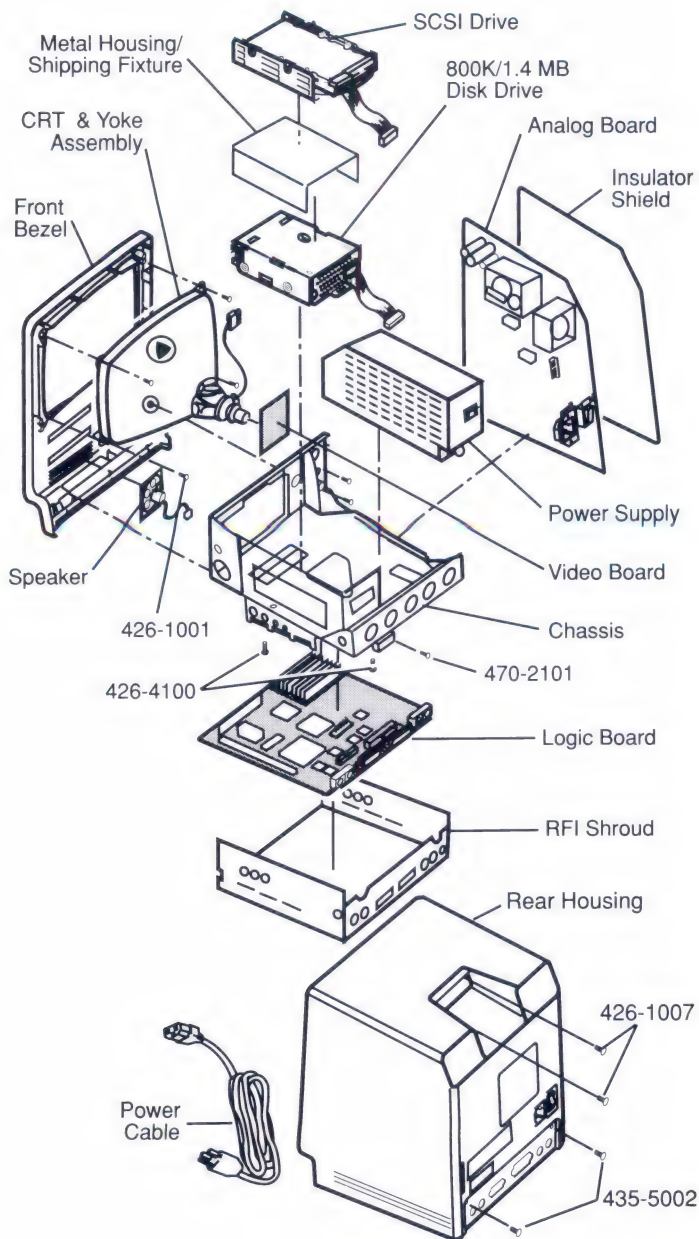


SE, SE/30, &
Classic



Macintosh SE, SE/30, and Classic

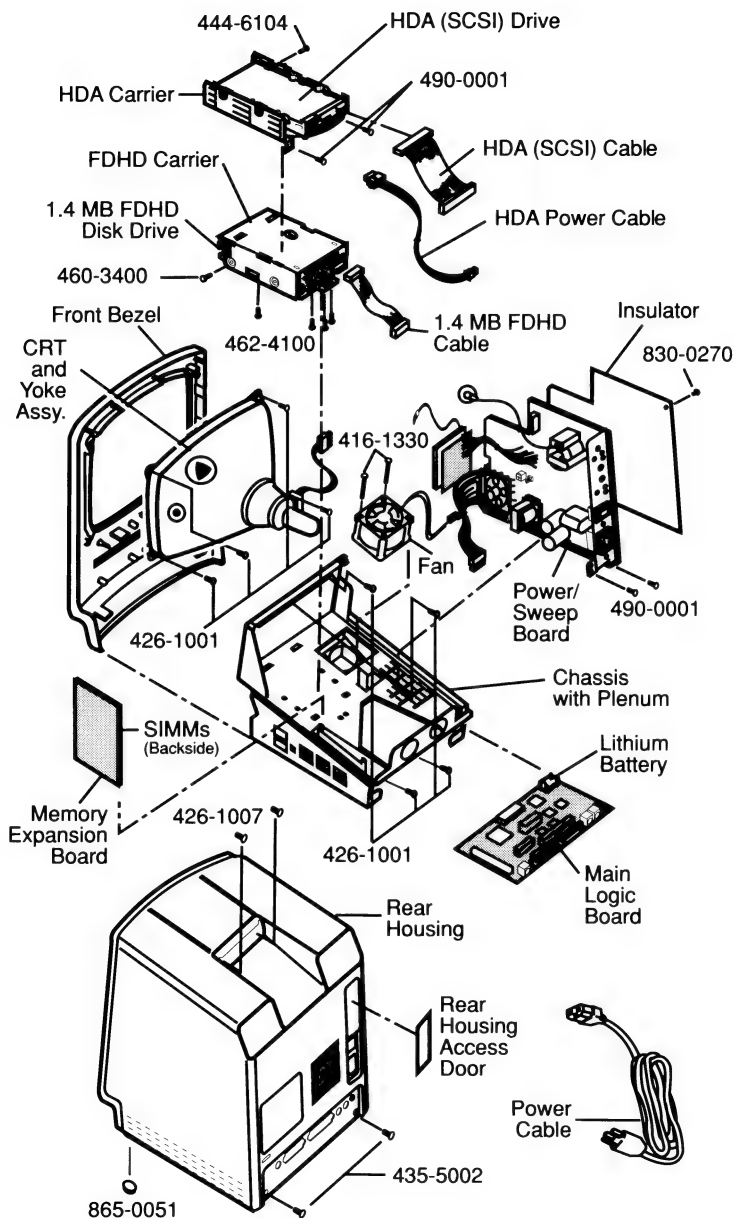
Exploded View—Macintosh SE and SE/30



SE, SE/30, &
Classic

Macintosh SE, SE/30, and Classic

Exploded View—Macintosh Classic





Macintosh SE, SE/30, and Classic

Parts List

| | |
|------------------------------------------------------------------------|----------|
| Analog Board, Macintosh SE & SE/30 | 661-0371 |
| Brightness Knob | 865-0047 |
| Fan Kit | 076-0311 |
| Fastener, Snap-in Plastic | 830-0240 |
| Insulator, Analog Board | 725-0020 |
| Lower Ground Clip | 805-0576 |
| Screw, M 2.9 x 10 | 470-2101 |
| Screw, M 3 x .5 x 6 | 462-3100 |
| Screw, M 3 x .5 x 10 PN CR, Zinc | 416-1310 |
| Washer, Lock, Internal Tooth | 860-0282 |
| Cable, Power AC | 590-0380 |
| Chassis with Plenum, Macintosh Classic | 805-0985 |
| Screw, Tap, M 4.22 x 1.41 x 13, Torx, Zinc (chassis to bezel) | 426-1001 |
| Chassis, Macintosh SE and Macintosh SE/30 | 805-0938 |
| Chassis—Accessories, Macintosh SE and SE/30 | |
| Bracket | 805-0939 |
| Screw, M 2.9 x 10 | 470-2101 |
| Screw, Tap, M 4.22 x 1.41 x 13, Torx, Zinc (chassis to bezel) | 426-1001 |
| CRT and Yoke Assembly | 076-0103 |
| Screw, Tap, M 4.22 x 1.41 x 13, Pan, Torx, Zinc (CRT to Chassis) | 426-1001 |
| Disk Drive, Apple 3.5," 800K (Macintosh SE only) | 661-0345 |
| Disk Drive, Apple 3.5," 1.4 MB FDHD/SuperDrive | 661-0474 |
| Disk Drive—Accessories | |
| Back Plate, Drive 2 (Macintosh SE only) | 805-0914 |
| Cable, 800K 3.5" Internal Drive (red or yellow stripe) | 590-0188 |
| Cable, 800K or 1.4MB 3.5" Internal Drive (yellow stripe) | 590-0437 |
| Cable, 1.4 MB FDHD, Internal (Macintosh Classic only) | 590-0167 |
| Disk Drive Carrier, 800K or 1.4MB | 805-5050 |
| Packing Disk, 2-sided (for transporting) | 003-0003 |
| Screw, M 3 x 0.5 x 6 (drive carrier to drive) (Macintosh Classic only) | 460-3400 |
| Screw, M 3.5 x .6 x 8, PNCRS Rec (drive carrier to chassis) | 462-4100 |
| Service Packaging, 800K and 1.4 MB FDHD Drives | 602-0210 |
| Fan, Macintosh Classic | 982-0055 |
| Screw, M 3 x 0.5 x 30 mm (fan to plenum) | 416-1330 |
| Front Bezel with Speaker, Slot Cover, Macintosh SE (800K) | 810-0399 |
| Front Bezel with Speaker, Slot Cover, Macintosh SE (FDHD) | 810-0422 |
| Front Bezel with Speaker, Macintosh SE/30 (800K) | 630-5499 |
| Front Bezel, Macintosh Classic | 630-5825 |
| Front Bezel—Accessories, Macintosh SE and SE/30 | |
| Speaker | 600-0393 |
| Apple Logo Plate Label | 825-1256 |
| Slot Cover Bezel (Macintosh SE only) | 630-5330 |
| Slot Cover Retainer (Macintosh SE only) | 805-0908 |
| HDA, 20 MB, Internal 3.5 SCSI, Rev. A (Macintosh SE only) | 661-0373 |
| HDA, 20 MB, Internal 3.5 SCSI, Rev. B (Macintosh SE only) | 661-0612 |
| HDA, 40 MB, Internal 3.5 SCSI (Macintosh SE and SE/30) | 661-0464 |
| HDA, 80 MB, Internal 3.5 SCSI (Macintosh SE /30 only) | 661-0600 |
| HDA—Accessories, Macintosh SE and SE/30 | |
| Cable, HDA I/O | 590-0211 |
| Cable, HDA LED (amber) | 590-0506 |
| Cable, HDA LED (red) | 590-0237 |
| Cable, Internal Power, HDA | 590-0505 |
| Frame, HDA, Internal, 3.5 SCSI | 805-5066 |

Macintosh SE, SE/30, and Classic

Parts List



| | |
|-----------------------------------------------------------------------------|----------|
| Service Packaging, 3.5 HDA | 602-0164 |
| HDA, 1" Internal, 40 MB, 3.5" SCSI (Macintosh Classic only) | 661-0614 |
| Cable, HDA, Internal (SCSI connector cable) | 590-0211 |
| Cable, HDA, Power | 590-0521 |
| HDA Carrier | 805-0950 |
| Screw, 6 - 32 x 0.250 (HDA carrier to HDA) | 444-6104 |
| Screw (HDA carrier to FDHD carrier) | 490-0001 |
| Service Packaging, 3.5" HDA | 602-0164 |
| Keyboard, Apple* | 661-0383 |
| Main Logic Board, Macintosh SE 800K (w/o RAM) | 661-0526 |
| Cable, Logic Board Power Interconnect | 590-0392 |
| Connector, Jumper (Set of 10) | 517-0546 |
| IC, SWIM | 344-0062 |
| Lithium Battery (with Leads) | 742-0009 |
| Lithium Battery (w/o Leads) | 742-0011 |
| Resistor, 150 Ohms, .25 W, $\pm 5\%$ | 101-4151 |
| ROM, High, Macintosh SE FDHD Upgrade | 661-0701 |
| ROM, Low, Macintosh SE FDHD Upgrade | 661-0702 |
| Shroud, RFI, Macintosh SE | 805-5060 |
| Main Logic Board, Macintosh SE (FDHD) (w/o RAM) | 661-0536 |
| Battery Holder Cover | 520-0344 |
| Cable, Logic Board Power Interconnect | 590-0392 |
| Lithium Battery (w/o Leads) | 742-0011 |
| Shroud, RFI, Macintosh SE | 805-5060 |
| Main Logic Board, Macintosh SE/30 (w/o RAM) | 661-0527 |
| Battery Holder Cover | 520-0344 |
| Cable, Logic Board Power Interconnect | 590-0392 |
| Lithium Battery (without Leads) | 742-0011 |
| Shroud, RFI, Macintosh SE/30 | 805-0969 |
| Main Logic Board, Macintosh Classic | 661-0596 |
| Internal SCSI Terminator | 630-0408 |
| Lithium Battery (w/o leads) | 742-0011 |
| Memory Expansion Board (without SIMMs), Macintosh Classic | 661-0598 |
| Mouse, ADB* | 661-0479 |
| Power Supply, Macintosh SE and SE/30 | 661-0370 |
| Power/Sweep Board 110 V, Macintosh Classic | 661-0597 |
| Power/Sweep Board 220 V, Macintosh Classic | 661-0599 |
| Power/Sweep Board—Accessories, Macintosh Classic | |
| Insulator, Power/Sweep Board | 815-1216 |
| Rivet, Nylon Snap-In, Black | 830-0270 |
| Screw (power/sweep to chassis) | 490-0001 |
| Rear Housing Assembly with Door and Feet, Macintosh SE and SE/30 | 630-5271 |
| Agency Approval Label, Macintosh SE | 825-2021 |
| Agency Approval Label, Macintosh SE/30 | 825-2043 |
| Rear Housing Assembly with Feet, Macintosh Classic | 630-5812 |
| Platinum Foot | 865-0051 |
| Rear Housing Access Door | 815-1195 |
| Screw, Tap, 8-32 x .625, Fill, Torx, Black Zinc Oxide (Main Case) | 435-5002 |
| Screw, Tap, M 4.22 x 1.41 x 16, Pan, Torx, Zinc (Main Case) | 426-1007 |

***For additional ADB input devices and part numbers, see General Information.**



Macintosh SE, SE/30, and Classic

Parts List & Video Adjustments

| | |
|-------------------------------------------------------------------|----------|
| Audio Extension Cable | 590-0612 |
| Foot, Platinum | 865-0051 |
| Rear Housing Door | 815-0986 |
| Reset/Interrupt Switch | 815-1008 |
| Screw, Tap, 8-32 x .625, Fill, Torx, Black Zinc Oxide (Main Case) | 435-5002 |
| Screw, Tap, M 4.22 x 1.41 x 16, Pan, Torx, Zinc (Main Case) | 426-1007 |
| Upper Ground Clip | 805-0575 |
| SIMMs—Macintosh SE, SE/30, and Classic | |
| SIMM, 256K, 120 ns | 661-0402 |
| SIMM, 1 MB, 120 ns | 661-0403 |
| SIMM, DIP, 256K | 661-0494 |
| SIMM, DIP, 1 MB | 661-0410 |
| Video Board, Macintosh SE & SE/30 | 982-0024 |
| Ferrite Bead, Clamp-on | 159-0061 |

Macintosh SE and SE/30 Video Adjustments

Although the exact location of the adjustment controls differs slightly, the procedures for performing yoke and video adjustments are the same on the Macintosh SE and SE/30 as on the Macintosh and Macintosh Plus. **Refer to the Macintosh and Macintosh Plus tab for these adjustments.**

Macintosh Classic Video Adjustments

All Macintosh Classic video adjustments except the tilt adjustment are made from the service panel at the back of the computer under the service panel door. (For the Tilt Adjustment Procedure, refer to the **Macintosh and Macintosh Plus** tab.)

You must use the *MacTest CL* Brightness and Video test patterns to adjust the Macintosh Classic correctly. Before performing the following adjustments, make sure the computer has been on for at least 30 minutes.

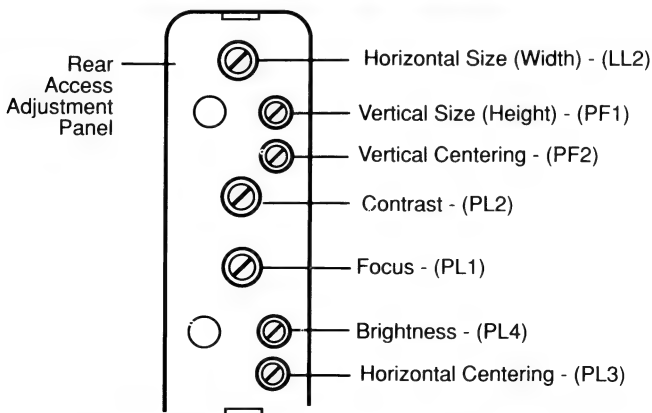


Figure: Macintosh Classic Service Panel Adjustments



Brightness and Contrast

1. Turn the computer so that the back is toward you, and place a mirror in front of the CRT screen. Remove the service panel door.
2. Boot *MacTest CL* and select **Brightness** from the MacTest CL Adjustments menu. Click the mouse button once to advance to the first brightness level.
3. Set your light meter (Sekonic Multi-Lumi, model L-248) for the 10-to-18 range.
4. Using a plastic flat-blade tweaker, adjust contrast pot PL2 (**see Figure on previous page**) so that the luminance at the center of the screen reads at the high end of the black area between 10 and 11 on the light meter.
5. Click the mouse button to go to the next brightness level.
6. Set the light meter for the 2-to-10 range. Using a plastic hex alignment tool, adjust brightness pot PL4 (**see Figure on previous page**) so that the luminance at the center of the screen reads at the top end of 7 on the light meter.
7. Click the mouse button again to go to the next brightness level.
8. Reset the light meter for the 10-to-18 range and be sure the luminance at the center of the screen reads at the high end of the black area between 10 and 11 on the light meter. If it does not, repeat steps 2 through 8.

To generate the test patterns for the following adjustments, select **Video** from the *MacTest CL* Adjustments menu and click to advance to the pattern you need.

Centering Adjustments

1. Select the all-white or crosshatch pattern (with white background). Using a plastic hex alignment tool, adjust horizontal centering pot PL3 to center the display horizontally within the bezel.
2. Using a plastic hex alignment tool, adjust vertical centering pot PF2 to center the picture vertically within the bezel.

Size Adjustments

1. Select the all-white or crosshatch display (with white background). Using a plastic hex alignment tool, adjust horizontal size pot LL2 until the picture is approximately 7 inches wide.
2. Using a plastic hex alignment tool, adjust vertical size pot PF1 until the picture is approximately 4.7 inches high.

Focus Adjustment

- Select the focus display (with % signs). Using a plastic flat-blade tweaker, adjust focus pot PL1 for the best overall focus.



Macintosh SE, SE/30, and Classic

Symptom/Cure Chart

Video Problems

Solutions

Screen is dark;
audio and drive
operate

1. Readjust brightness.
2. Readjust cutoff (Macintosh Classic only).
3. Check yoke cable connection.
4. Replace power/sweep board (Macintosh Classic) or analog board (Macintosh SE and SE/30).
5. Replace video board (Macintosh SE and SE/30).
6. Replace main logic board.
7. Replace CRT.

Screen is bright and
audio is present
but no video
informaton is visible

1. Replace power/sweep board (Macintosh Classic) or analog board (Macintosh SE and SE/30).
2. Replace video board (Macintosh SE and SE/30).
3. Replace main logic board.

Screen is completely
dark and fan is not
running

1. Replace power supply (Macintosh SE and SE/30).
2. Replace power/sweep board (Macintosh Classic) or analog board (Macintosh SE and SE/30).

A single vertical/
horizontal line
is displayed

1. Replace power/sweep board (Macintosh Classic) or analog board (Macintosh SE and SE/30).
2. Replace video board (Macintosh SE and SE/30).
3. Replace main logic board.
4. Replace CRT.

Vertical/horizontal
bars or stripes
are displayed

1. Replace power/sweep board (Macintosh Classic) or analog board (Macintosh SE and SE/30).
2. Replace main logic board.

A white dot
appears in
center of screen

1. Check yoke cable connection.
2. Replace power/sweep board (Macintosh Classic) or analog board (Macintosh SE and SE/30).
3. Replace CRT.

Screen jitters

1. Move the computer away from adjacent electrical equipment that may cause interference.
2. Replace power/sweep board (Macintosh Classic) or analog board (Macintosh SE and SE/30).

Peripheral Problems

Solutions

Cursor does not
move

1. Check mouse connection.
2. If mouse was connected to a keyboard, connect it to a rear ADB port. If mouse works, replace keyboard.
3. If mouse does not work in any ADB port, replace mouse.
4. Replace main logic board.

Cursor moves, but
clicking the mouse
button has no effect

1. Replace mouse.
2. Replace main logic board.



| | |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No response to any key on the keyboard | <ol style="list-style-type: none"> 1. Check keyboard connection to rear ADB port. 2. Replace keyboard cable. 3. Replace keyboard. 4. Replace main logic board. |
| Cannot double-click to open a disk, application, or server | <ol style="list-style-type: none"> 1. Remove extra system files on hard disk. 2. Clear parameter RAM. Hold down <Shift> <Option> <Command> keys and select Control Panel from Apple menu. Reset mouse controls. 3. If mouse was connected to a keyboard, connect it to a rear ADB port. If mouse works, replace keyboard. 4. If mouse fails in any ADB port, replace mouse. 5. Replace main logic board. |
| Known-good ImageWriter will not print | <ol style="list-style-type: none"> 1. Make sure the Chooser and Control Panel are set correctly. 2. Replace software with known-good software. 3. Replace printer interface cable. 4. Replace main logic board. 5. Replace power/sweep board. |
| Known-good LaserWriter will not print | <ol style="list-style-type: none"> 1. Make sure the Chooser and Control Panel are set correctly. 2. Replace software with known-good software. 3. Refer to the Networks tab in the <i>Apple Service Technical Procedures</i>. |
| Drive Problems | Solutions |
| Audio and video are present, but one internal drive does not operate | <ol style="list-style-type: none"> 1. Replace bad disk. 2. Replace internal disk drive cable. 3. Replace internal disk drive. 4. Replace main logic board. |
| Audio and video are present, but neither internal drive operates | <ol style="list-style-type: none"> 1. Replace bad disk. 2. Replace main logic board. |
| External drive does not operate | <ol style="list-style-type: none"> 1. Replace bad disk. 2. Be sure external drive is on the right side of the Macintosh. 3. Replace external drive. 4. Replace main logic board. |
| Will not eject disk | <ol style="list-style-type: none"> 1. Eject disk manually by pushing an opened paper clip into hole beside drive. 2. Power off system and hold mouse button down while powering back on (to complete eject cycle). 3. Replace disk drive. |

continued...



Macintosh SE, SE/30, and Classic Symptom/Cure Chart

Drive Problems (continued)

Solutions

Disk ejects; display shows icon with blinking "X"

1. Replace disk with known-good system disk.
2. Replace disk drive.
3. Replace main logic board.

Unable to insert disk all the way

1. Eject disk manually by pushing an opened paper clip into hole beside the drive.
2. Switch off system power and hold mouse button down while switching power back on (to complete eject cycle).
3. Replace disk drive.

Internal disk drive runs continuously

1. Replace bad disk.
2. Replace disk drive.
3. Replace main logic board.
4. Replace disk drive cable.

SCSI Problems

Solutions

Internal or external hard disk will not operate

1. Verify that SCSI loopback card is not attached.
2. Replace hard disk drive cable.
3. Replace hard disk drive.
4. Replace main logic board.

Works with internal or external SCSI device but will not work with both

1. Verify that SCSI device ID switch setting on external device is higher than 0. Also verify that ID switch setting on external SCSI device does not duplicate ID switch setting on any other attached SCSI device.
2. Replace terminator on the external device.
3. Verify that terminator is installed on the internal SCSI drive.
4. Replace SCSI device select cable.

Miscellaneous Problems

Solutions

Clicking, chirping, or thumping sound

1. Verify that main logic board power cable is connected at J12 on main logic board.
2. Replace power supply (Macintosh SE and SE/30).
3. Replace power/sweep board (Macintosh Classic) or analog board (Macintosh SE and SE/30).
4. Replace main logic board.

No video, no audio, and no drive operation

1. Connect power cord and switch power on.
2. Replace power cord.
3. Replace power supply (Macintosh SE and SE/30).
4. Replace power/sweep board (Macintosh Classic) or analog board (Macintosh SE and SE/30).
5. Replace main logic board.



Smoke/odor

1. Replace power supply (Macintosh SE and SE/30).
2. Replace power/sweep board (Macintosh Classic) or analog board (Macintosh SE and SE/30).

Sad Macintosh icon

1. Replace bad floppy disk.
2. Replace SIMM(s) if code matches any of those on SIMM Error Codes chart in this tab section (Macintosh SE and SE/30).
3. Verify that three-pin jumper on logic board is configured correctly for system RAM (Macintosh SE only).
4. Verify that jumper on memory expansion board is configured correctly for "SIMMs" or "No SIMMs" (Macintosh Classic).
5. Replace memory expansion board (Macintosh Classic).
6. Replace main logic board.

Sad Macintosh icon and black lines are displayed; screeching sound

1. Verify that three-pin jumper on logic board is configured correctly for system RAM (Macintosh SE only).
2. Verify that jumper on memory expansion board is configured correctly for "SIMMs" or "No SIMMs" (Macintosh Classic).
3. Replace memory expansion board (Macintosh Classic).
4. Replace main logic board.



Macintosh SE, SE/30, and Classic Specifications

| Macintosh SE Specifications | |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68000 32-bit internal architecture 7.83 MHz clock frequency |
| Memory | 1 or 2 MB of RAM, expandable to 4 MB 256K of ROM 256 bytes of parameter memory |
| Video Display | Built-in 9-inch diagonal, high-resolution, 512-by-342-pixel, bit-mapped display |
| Interfaces | Two Apple Desktop Bus™ (ADB) ports Two RS-232/RS-422 serial ports SCSI interface One DB-19 external disk drive port Macintosh SE internal expansion slot One sound port |
| Internal Storage | One 1.4 MB FDHD™ SuperDrive™ (800K drive in older versions of the SE) Optional second FDHD SuperDrive (800K drive in older versions of the SE) Optional internal Hard Disk 20SC, 40SC |
| Sound | Four-voice sound with 8-bit digital/analog conversion using 22-KHz sampling rate |
| Clock/Calendar | CMOS custom chip with seven-year battery |
| Electrical | Line voltage: 120 to 240 VAC, RMS automatically configured Frequency: 48 to 62 Hz Maximum power: 75 watts |

Macintosh SE, SE/30, and Classic

Specifications



| Macintosh SE/30 Specifications | |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68030 32-bit internal architecture 15.667 MHz clock frequency Built-in paged memory management unit (PMMU) 256-byte instruction and data caches |
| Coprocessor | MC68882 floating-point unit |
| Memory | 1 or 4 MB of RAM, expandable to 8 MB 256K of ROM 256 bytes of user-set-parameter memory |
| Video Display | Built-in 9-inch diagonal, high-resolution, 512-by-342-pixel, bit-mapped display Color QuickDraw™ in ROM provides support for grayscale and color video cards installed in the 030 Direct Slot |
| Interfaces | Two Apple Desktop Bus (ADB) ports Two RS-232/RS-422 serial ports SCSI interface 030 direct slot supporting full 32-bit address and data lines through 120-pin Euro-DIN connector Stereo sound port for external audio amplifier One DB-19 external disk drive port |
| Internal Storage | One 1.4 MB FDHD SuperDrive Optional internal Hard Disk 40SC, 80SC |
| Sound | Apple sound chip including four-voice, wavetable synthesis and stereo sampling generator Mixed stereo monophonic sound output through internal speaker |
| Clock/Calendar | CMOS custom chip with long-life battery |
| Electrical | Line voltage: 120 to 240 VAC, RMS automatically configured Frequency: 48 to 62 Hz, single phase Maximum power: 75 watts |



Macintosh SE, SE/30, and Classic Specifications

Macintosh Classic Specifications

| | |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68000 32-bit internal architecture 8.3336 MHz clock frequency 256-byte instruction and data caches |
| Memory | 1 MB of RAM, expandable to 4 MB (120 ns or faster SIMMs) 256K of ROM 256 bytes of user-set-parameter memory |
| Video Display | Built-in 9-inch diagonal, high-resolution, 512-by- 342-pixel, bit-mapped monochrome display |
| Interfaces | One Apple Desktop Bus (ADB) port Two mini DIN-8 RS-232/RS-422 serial ports Internal and external SCSI interface ports 44-pin memory expansion connector Sound port for external amplifier or headphones One DB-19 external disk drive port |
| Internal Storage | One 1.4 MB FDHD SuperDrive Optional internal Hard Disk 40SC |
| Sound | Four-voice sound with 8-bit digital/analog conversion using 22-KHz sampling rate |
| Clock/Calendar | CMOS custom chip with seven-year battery |
| Electrical | Line voltage: 100 to 120 VAC Frequency: 50 to 60 Hz, single phase Maximum power: 100 watts |



When the Macintosh SE is switched on, the ROM runs a series of logic board tests. If any of the tests fails, a Sad Macintosh icon and a two-row, eight-digit error code appears. Error codes indicating SIMM failures are shown in the table below. Identify the SIMM socket number for the type of logic board in the customer's computer and replace the bad SIMM.

Note: Paired XXs in the error codes indicate any number except 0. If the error code is unreadable, press the reset switch and watch carefully—the error code will appear briefly. If the error code is still unreadable, try replacing SIMMs.

Macintosh SE SIMM Error Codes

| Error Code | SIMM # Solder Type ¹ | SIMM # Jumper Type ² | Error Code | SIMM # Solder Type ¹ | SIMM # Jumper Type ² |
|----------------------|------------------------------------|------------------------------------|----------------------|------------------------------------|------------------------------------|
| 0000000E 000000XX | 1 | 3 | 00000003 0000XX00 | 2 | 4 |
| 0000000E 00XX00XX | 1 | 3 | 00000003 XX00XX00 | 2 | 4 |
| 0000000E 0000XX00 | 2 | 4 | 00000004 000000XX | 3 | 1 |
| 0000000E XX00XX00 | 2 | 4 | 00000004 00XX00XX | 3 | 1 |
| 00000002 000000XX | 1 | 3 | 00000004 0000XX00 | 4 | 2 |
| 00000002 00XX00XX | 1 | 3 | 00000004 XX00XX00 | 4 | 2 |
| 00000002 0000XX00 | 2 | 4 | 00000005 000000XX | 3 | 1 |
| 00000002 XX00XX00 | 2 | 4 | 00000005 00XX00XX | 3 | 1 |
| 00000003 000000XX | 1 | 3 | 00000005 0000XX00 | 4 | 2 |
| 00000003 00XX00XX | 1 | 3 | 00000005 XX00XX00 | 4 | 2 |

¹The Macintosh SE uses both solder-type and jumper-type logic boards. To correctly locate the SIMM socket with the faulty SIMM, first identify the type of logic board in your customer's computer. This column refers to solder-type boards.

²This column refers to Macintosh SE computers with jumper-type logic boards.



Macintosh SE, SE/30, and Classic

Macintosh SE Memory Upgrade

Two logic boards are available for the Macintosh SE. The original logic board uses solder-type resistors to identify system memory configurations; the revised logic board uses a jumper to identify system memory. Also note that memory configurations requiring only two SIMMs use SIMM slots 1 and 2 on the original board, but use slots 3 and 4 on the revised board. The Macintosh SE requires 150 ns (or faster) SIMMs (indicated by the -xx number after the manufacturer's part number).

Upgrade Procedure (Solder-Type Resistors)

1. Clip or install the needed resistor (see the chart and figure below).
2. Install the SIMMs as indicated in the chart below.

| RAM | Resistors | SIMMs |
|--------|------------------------------|----------------------------------------------------------|
| 1 MB | R35 installed R36 removed | 4—256K SIMMs |
| 2 MB | R35 removed R36 installed | 2—1 MB SIMMs (slots 1 & 2) |
| 2.5 MB | No resistors | 2—1 MB SIMMs (slots 1 & 2) 2—256K SIMMs (slots 3 & 4) |
| 4 MB | No resistors | 4—1 MB SIMMs |

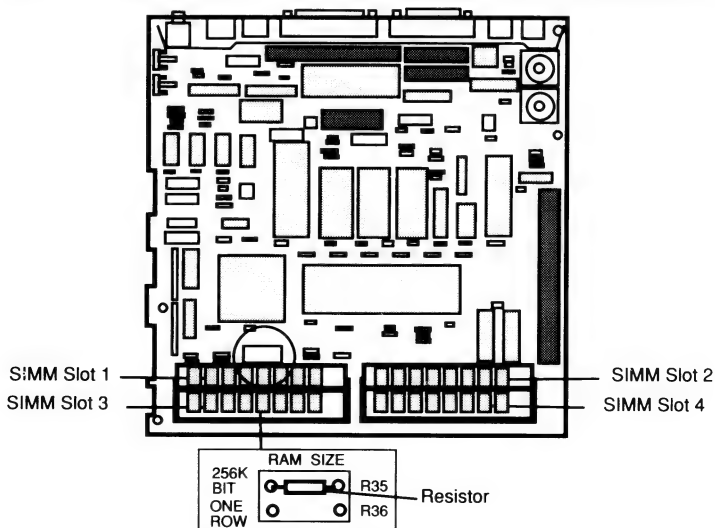

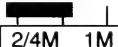
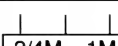
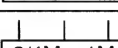


Figure: Macintosh SE Solder-Type Logic Board



Upgrade Procedure (Jumper-Type Resistors)

1. Move the jumper to the appropriate pins, or remove it altogether (**refer to the chart and figure below**).
2. Install the SIMMs as shown below.

| RAM | Jumpers | SIMMs |
|--------|-----------------------------------------------------------------------------------|----------------------------------------------------------|
| 1 MB |  | 4—256K SIMMs |
| 2 MB |  | 2—1 MB SIMMs (slots 3 & 4) |
| 2.5 MB |  | 2—1 MB SIMMs (slots 3 & 4) 2—256K SIMMs (slots 1 & 2) |
| 4 MB |  | 4—1 MB SIMMs |

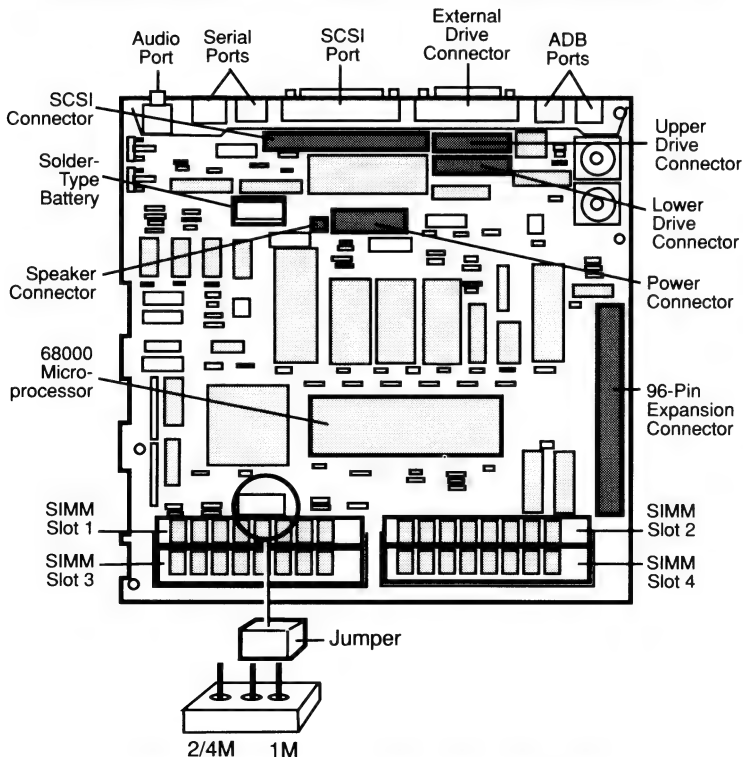


Figure: Macintosh SE Jumper-Type Logic Board



Macintosh SE, SE/30, and Classic

Macintosh SE/30 Memory Upgrade

The Macintosh SE/30 requires 120 ns (or faster) SIMMs. Using 150 ns SIMMs will cause serious timing problems. Oversized 256K and 1 MB DIP SIMMs should be installed in Bank A only. All SIMMs in each bank must be the same memory size.

| SIZE | BANK A | BANK B |
|------|--------------|--------------|
| 2 MB | 4—256K SIMMs | 4—256K SIMMs |
| 4 MB | 4—1 MB SIMMs | |
| 5 MB | 4—1 MB SIMMs | 4—256K SIMMs |
| 8 MB | 4—1 MB SIMMs | 4—1 MB SIMMs |

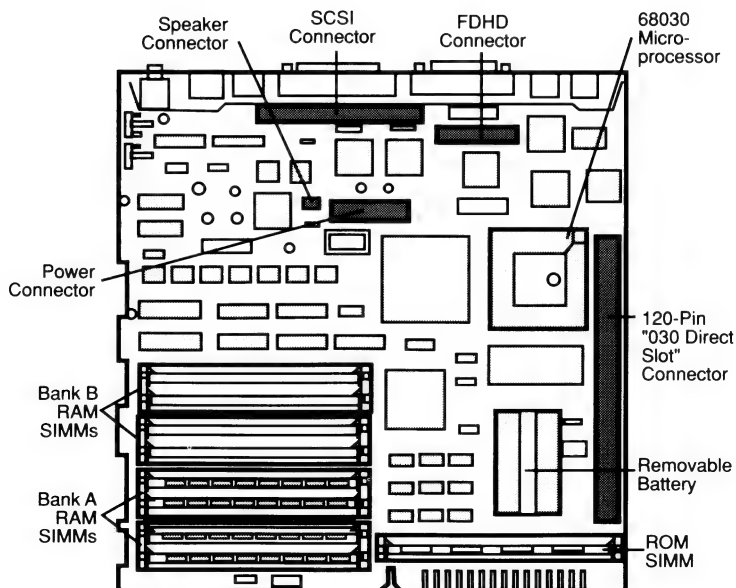


Figure: Macintosh SE/30 Logic Board



Using the FDHD SuperDrive in the Macintosh SE requires using System software version 6.0.3 or higher. If the software is lower than 6.0.2, the SuperDrive will be recognized as an 800K mechanism.

Macintosh SE FDHD Upgrade

1. Remove the cover and discharge the CRT.
2. Place the Macintosh SE on the grounded workbench pad and put on your grounding wriststrap.
3. Remove the video board, the SCSI hard disk drive or upper 800K disk drive, the main logic board, and the lower 800K disk drive.
4. Using the IC extractor, remove the IWM chip at location D8 and the two ROM chips at locations D6 and D7 on the main logic board.
5. Install the SWIM chip and the two new ROMs as indicated in the following chart. The notch at the end of the SWIM chip and each ROM should face the front of the logic board (toward the SIMMs).

| <u>ROM</u> | <u>P/N</u> | <u>Location</u> |
|------------|------------|-----------------|
| SWIM | 344-0062 | D8 |
| HI | 342-0701 | D6 |
| LO | 342-0702 | D7 |

6. Install the FDHD SuperDrive in the lower internal drive.
7. Replace the main logic board; the SCSI hard disk, upper 800K disk drive, or second FDHD SuperDrive; the video board; and the cover.
8. Place the appropriate 1.4 MB and 800K labels in the grooves next to the upper and lower disk drive slots on the front bezel of the Macintosh SE.

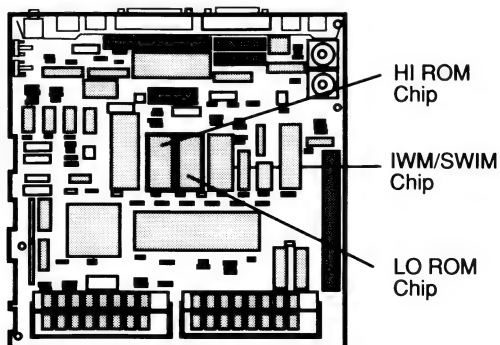


Figure: Macintosh SE Logic Board



Macintosh SE, SE/30, and Classic

Macintosh Classic Memory Upgrade

The Macintosh Classic main logic board has 1 MB of soldered random-access memory (RAM). A 1 MB Macintosh Classic may be upgraded by adding the optional memory expansion board, which contains an additional 1 MB of soldered DRAM plus one pair of SIMM slots. The system may then be upgraded further by adding two 256K or two 1MB SIMMs to the memory expansion board.

The two SIMM slots must contain two SIMMs of like memory capacity (two 256K SIMMS, or two 1 MB SIMMS), or both slots must be left empty. You must use 120 ns (or faster) SIMMs in the Macintosh Classic. (**Refer to "SIMM Identification" under the General Information tab.**)

Upgrade Procedure

The memory expansion board connects at a right angle to the main logic board and is supported by the side of the chassis (**see top Figure**). The jumper on the memory expansion board must be set correctly for the presence or absence of SIMMs. For the board to operate properly when SIMMs are installed, the jumper must be over the first and second pins from the outside edge; for board operation without SIMMs, the jumper must be over the second and third pins (**see bottom Figure**).

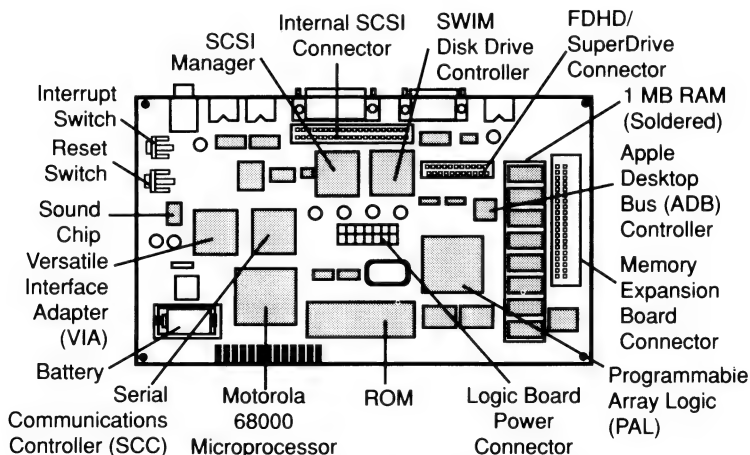


Figure: Classic Main Logic Board

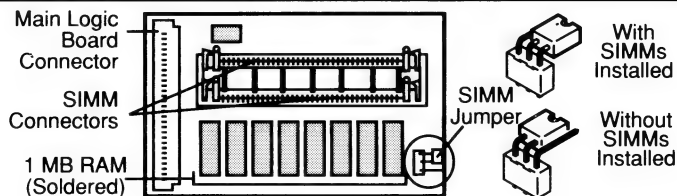


Figure: Classic Memory Expansion Board

Macintosh Portable

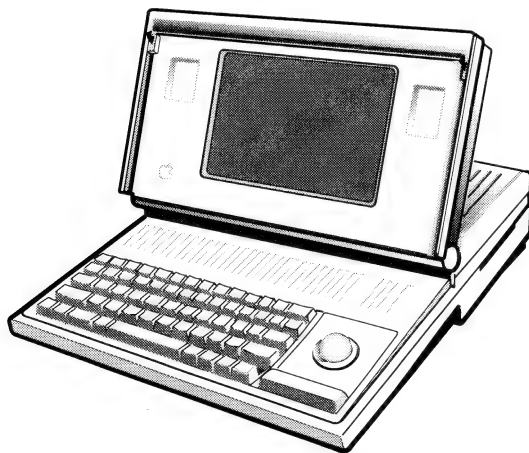
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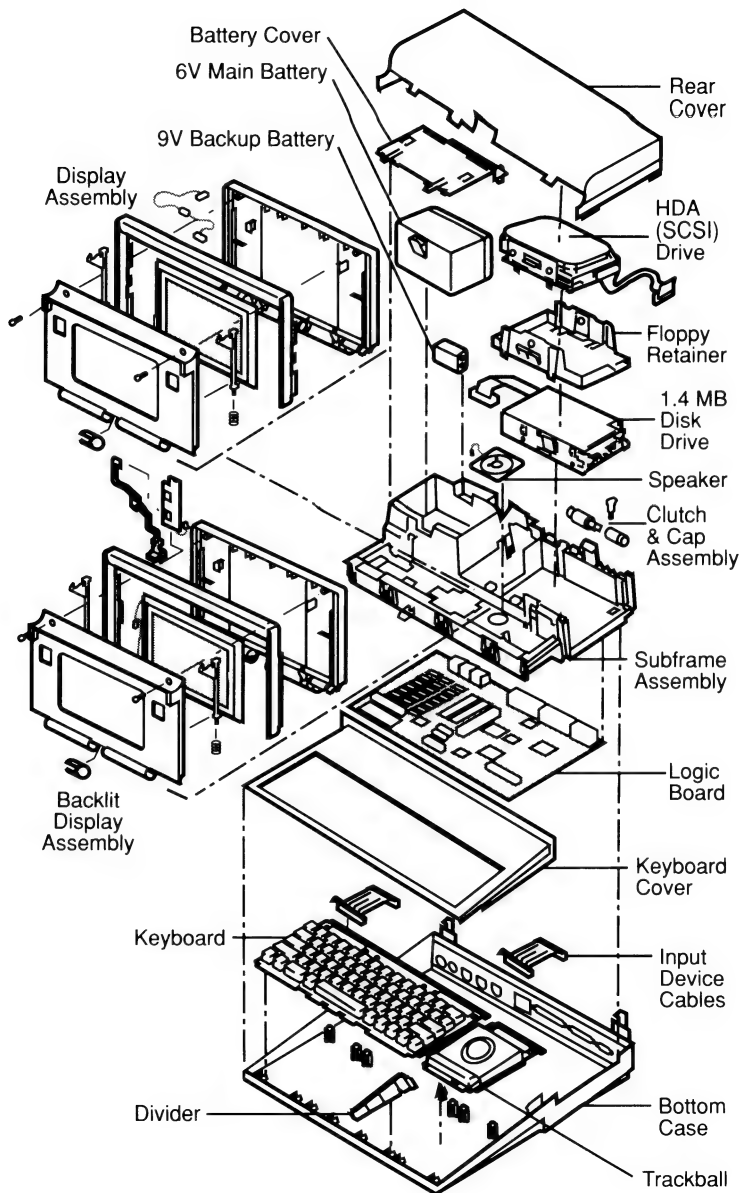
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Macintosh Portable

Exploded View



Macintosh Portable

Parts List



| | |
|------------------------------------------------------|------------|
| Battery Insulator | 865-0068 |
| Battery Pack (6V) | 076-0376 |
| Packaging, Battery (6 V) | 602-0208 |
| Battery Recharger | 630-6386 |
| Bottom Case | 630-5418 |
| Corner Foot | 865-0060 |
| Flat Foot | 865-0054 |
| Keyboard Spacer | 815-1093 |
| Modem Cap | 815-1111 |
| RFI Foam Gasket | 805-0973 |
| Carrying Case | 630-5574 |
| Carrying Case Strap | 699-0508 |
| Luggage Tag | 699-0142 |
| Disk Drive, Apple 3.5", 1.4 MB FDHD/SuperDrive | 661-0474 |
| Cable, 1.4 MB FDHD Internal | 590-0501 |
| Floppy Bezel | 815-1092 |
| Floppy Retainer | 815-1110 |
| Packaging, 800K & FDHD/SuperDrive | 602-0210 |
| Screw, FDHD/SuperDrive | 844-0018 |
| Shield, FDHD/SuperDrive | 805-0961 |
| Shipping Fixture, 1.4 MB Mechanism | 805-5050 |
| Display Assembly (Backlit & Nonbacklit) | |
| Case Handle | 630-5071 |
| Center Pivot Cover | 815-1108 |
| Clutch Cover | 815-1098 |
| Clutch Mechanism | 699-5070 |
| Clutch Retainer | 815-1109 |
| Latch Spring | 805-1120 |
| Machine Screw, Platinum | 450-0505 |
| Display Assembly, Nonbacklit | |
| Display Cable | 590-0502 |
| Display Housing Assembly | 652-0604 |
| LCD Display, Nonbacklit | 661-0473 |
| Display Assembly, Backlit | |
| Display Cable | 630-6280 |
| Display Housing Assembly | 652-0605 |
| Inverter PCA | 699-0515 |
| LCD Display, Backlit | 661-0647 |
| External Modem/Data Access Arrangement (DAA) | |
| Australia, Intl. XP 2400™ | X077-0235 |
| Austria, Intl. XP 2400 | AU077-0235 |
| Belgium, Intl. XP 2400 | FN077-0235 |
| Denmark, Intl. XP 2400 | DK077-0235 |
| Finland, Intl. XP 2400 | K077-0235 |
| France, Intl. XP 2400 | F077-0235 |
| Germany, Intl. XP 2400 | D077-0235 |
| Holland, Intl. XP 2400 | N077-0235 |
| Ireland, Intl. XP 2400 | ER077-0235 |
| Italy, Intl. XP 2400 | T077-0235 |
| Luxembourg, Intl. XP 2400 | LX077-0235 |
| Norway, Intl. XP 2400 | H077-0235 |
| Spain, Intl. XP 2400 | Y077-0235 |

continued...

Macintosh Portable

Parts List



| | |
|-------------------------------------------|------------|
| Mouse, Low-Power | 661-0585 |
| Ferrite Bead | 612-5019 |
| Mouse Ball (21.9 mm) | 699-8038 |
| Retainer, ADB Mouse Ball (38 mm) | 076-0231 |
| Numeric Keypad, Lightweight | 661-1611 |
| Numeric Keypad, Intl. PA Version | PA661-1611 |
| Numeric Keypad, Intl. Z Version | Z661-1611 |
| Numeric Keypad, Original | 661-0477 |
| Numeric Keypad, Intl. PA Version | PA661-0477 |
| Numeric Keypad, Intl. Z Version | Z661-0477 |
| Power Adapter/Charger | 699-0505 |
| Power Adapter/Charger, UK | B699-0505 |
| Power Adapter/Charger, Japan | JA699-0505 |
| Power Adapter/Charger, Australia | X699-0505 |
| Power Adapter/Charger, Europe, 220V | Z699-0505 |
| RAM Card, Pseudostatic, 1 MB | 661-0614 |
| RAM Card, Pseudostatic, 3 MB | 661-0613 |
| RAM Card, Static, 1 MB | 661-0480 |
| Rear Cover | 630-5687 |
| Standard Bezel | 810-1096 |
| Speaker | 600-0406 |
| Subframe Assembly | 630-5684 |
| Battery Connector | 805-0970 |
| Battery Cover | 630-5723 |
| Modem RFI Gasket | 805-0976 |
| Telephone Cable, U.S. | 590-0590 |
| Trackball Assembly | 661-0475 |
| Trackball Ball | 815-1133 |
| Trackball Retainer | 815-1134 |
| Wire Harness Assembly | 600-0425 |



Macintosh Portable

Specifications

Macintosh Portable Specifications

| | |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | CMOS 68000 16 MHz clock speed |
| Memory | 1 MB of low-power static RAM, expandable to 9 MB (on the original Macintosh Portable) 1, 2, or 4 MB of pseudostatic RAM, expandable to 8 MB (on the new Macintosh Portable) 256K of ROM, expandable to 4 MB |
| Screen | Active-matrix liquid crystal display, backlit on new units Full-page width 640 by 400 pixels |
| Input Devices | Built-in keyboard with standard Macintosh layout Low-power ADB mouse 1.3-inch diameter trackball pointing device 18-key numeric keypad (can be installed as an alternative to the trackball) |
| Internal Storage | One 1.4 MB FDHD SuperDrive Internal Hard Disk 40SC (optional on original Portable) |
| Interfaces | One external disk drive port One SCSI interface: uses a 50-pin internal connector and a DB-25 external connector One Apple Desktop Bus port allows daisy-chaining of peripheral devices One stereo sound port One power adapter port Two RS-232/RS-422 serial ports One video output port |
| Expansion Connectors | Three expansion slots for optional RAM, ROM, or 2400 bps modem 96-pin processor-direct slot |
| Sound | Apple custom digital sound chip |
| Electrical | Line voltage: 85 to 270 volts AC, 48 to 62 Hz Power: 15 watts maximum |

Macintosh Portable

Warnings and Cautions



Summary of Warnings and Cautions

The following warnings and cautions should be observed whenever you repair the Macintosh Portable computer. If you have not done so recently, take the time to review this important information.



CAUTION: Before replacing any modules within the Portable, always unplug the power adapter, remove the main battery, and replace the battery cover.



CAUTION: Failure to replace the battery cover could damage the computer. Replacing the battery cover disconnects the Portable from the 9-volt backup battery. Failure to do so leaves power connected to the logic board and could damage the modules removed.



WARNING: The 6 volt sealed lead-acid battery contains toxic chemicals and is considered toxic waste. If a bad battery is *not* physically damaged, return the battery to Apple—do not dispose with other trash. Return the battery in the same packaging used for new batteries. If a bad battery *is* physically damaged, do not return the battery to Apple. Dispose of such batteries according to local ordinances.



WARNING: Sulfuric acid in the main battery can cause severe burns to the skin and eyes. If you touch a damaged main battery, immediately wash your hands and any other contacted skin with water for at least five minutes.



CAUTION: The Macintosh Portable makes extensive use of low-power complementary metal oxide semiconductor (CMOS) devices. These devices are very susceptible to damage from electrostatic discharge (ESD). Observe appropriate ESD precautions.



CAUTION: The LCD display is extremely susceptible to ESD damage. As with all sensitive electronics, use a grounded workstation pad and grounding wriststrap when handling the display—and handle it **ONLY** by the edges. Do not remove the protective tape on the component side of the LCD display.



CAUTION: The bottom case and subframe of the Portable are coated to reduce electromagnetic interference. This protective coating can be damaged by skin oils. Avoid excessive handling of these modules.



Macintosh Portable

Module Replacement

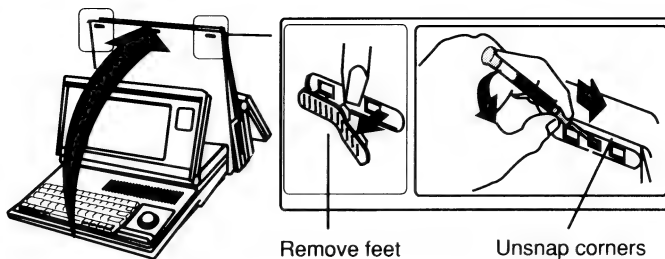


Figure: Removing the Keyboard Cover

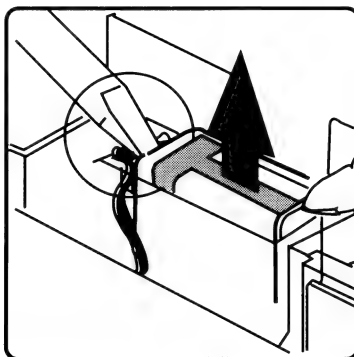


Figure: Removing the Backup Battery

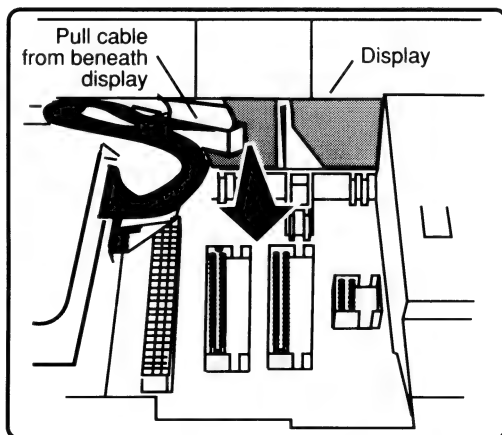


Figure: Removing the SCSI Drive

Macintosh Portable

Module Replacement



Summary of Module Removal Steps

Rear Cover

1. Place the computer on a grounded workstation mat.
2. Depress the two rear latches and lift off the rear cover.

Keyboard Cover

1. Open the display.
2. Using a jeweler's screwdriver, pop off the two feet beneath the keyboard (**see Figure on previous page**). Insert the screwdriver through the center holes, and push down and out to unsnap the corners.
3. Unsnap and remove the keyboard cover.

Main Battery

1. Remove the rear cover.
2. Slide off the battery cover.
3. Lift out the battery. If you are removing another module, replace the battery cover.

Backup Battery

Note: Removing the backup battery will erase parameter RAM. Before doing so, note all Control Panel settings so you can restore them later.

1. Access the main battery.
2. Use a jeweler's screwdriver to pry up the backup battery (**see Figure on previous page**).
3. Remove the battery and disconnect its cable.

Option Cards

1. Remove the rear cover and the main battery.
2. Replace the battery cover before removing any cards.

SCSI Drive

1. Remove the rear cover, main battery, and keyboard cover. Replace the battery cover.
2. Remove all option cards.
3. Disconnect the display and disk drive cables from connectors J19 and J18.
4. Close the display and slide out the disk drive cable (**see Figure on previous page**).
5. Unsnap the two plastic latches and remove the drive.



CAUTION: When replacing the drive cable beneath the display assembly, make sure the cable is not caught under the disk drive shield.

6. After installing the new SCSI drive, run *Macintosh Hard Disk Test* to verify correct operation. If you are using version 1.0 of *Macintosh Hard Disk Test*, be sure to operate the computer with the power adapter connected; do not use **Loop on selected tests**.

Upper Floppy

1. Remove the rear cover, main battery, and any option cards. Replace the battery cover.
2. Disconnect the drive cable from the drive.
3. Unsnap the two plastic latches and remove the drive.
4. Depress two metal tabs and remove the mechanism.



Macintosh Portable

Module Replacement

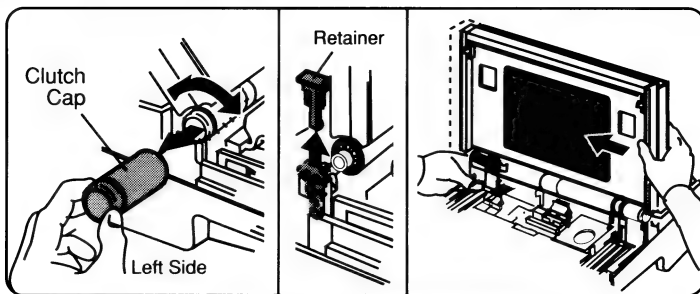


Figure: Removing the Display Assembly

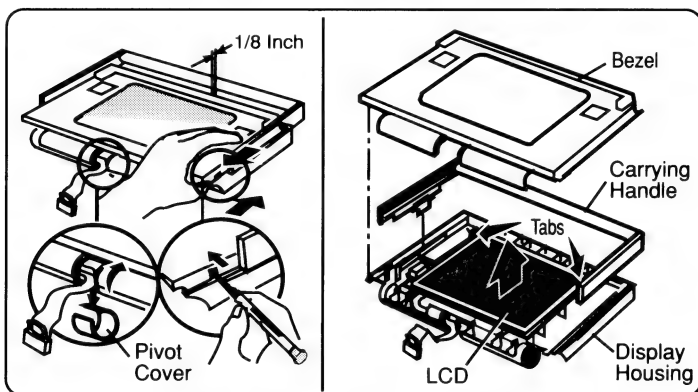


Figure: Removing the LCD Display

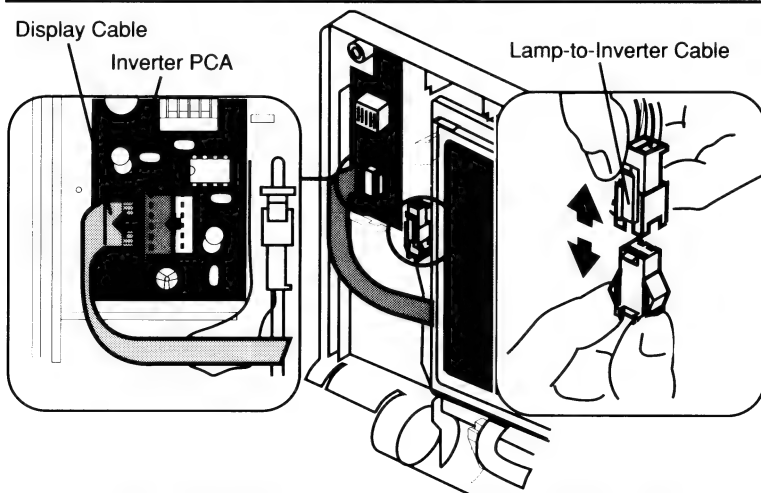


Figure: Removing the Inverter PCA (Backlit Display Only)

Macintosh Portable

Module Replacement



Lower Floppy

1. First remove the upper floppy or SCSI drive.
2. Disconnect the disk drive cable from the drive.
3. Lift the disk drive out of the subframe.

Trackball/ Numeric Keypad

1. Remove the rear cover, main battery, and keyboard cover. Replace the battery cover.
2. Disconnect the flat cable from the device(s) to be moved.
3. Unsnap and remove the device(s) from the case.

Speaker

1. Remove the rear cover, main battery, and keyboard cover. Replace the battery cover.
2. Disconnect the speaker cable from connector J16.
3. Depress the two plastic tabs and remove the speaker.

Display Assembly

1. Remove the rear cover, main battery, and keyboard cover. Replace the battery cover.
2. Disconnect the display cable from connector J19.
3. Gently twist back and forth, and remove the left clutch cap (**see Figure on previous page**).
4. Pull off the left clutch retainer (**see Figure on previous page**).
5. Push the display left as shown in the figure, and remove the left clutch mechanism.
6. Slide the display off the right clutch mechanism.

LCD Display (Nonbacklit)

1. Remove the rear cover, main battery, and display assembly. Replace the battery cover.
2. Pull out the carrying handle and remove the two Phillips screws (if present) from the upper right and upper-left corners of the display bezel.
3. Rotate and remove the center pivot cover (**see Figure on previous page**).
4. Using a jeweler's screwdriver, release the plastic bezel from the display housing and pull down on the bezel to remove it (**see Figure on previous page**). Repeat on both sides.
5. Remove the bezel and carrying handle.
6. Release the two plastic tabs at the upper-right and -left corners and remove the display (**see Figure on previous page**).
7. Disconnect the display cable.

LCD Display (Backlit only)

8. Depress the tab and disconnect the ccfl-lamp-to-inverter PCA cable (**see Figure on previous page**).
9. Disconnect the ribbon cable from the inverter PCA (**see Figure on previous page**).
10. To remove the inverter PCA, use a jeweler's screwdriver to gently pry it from the display housing.



Macintosh Portable

Module Replacement

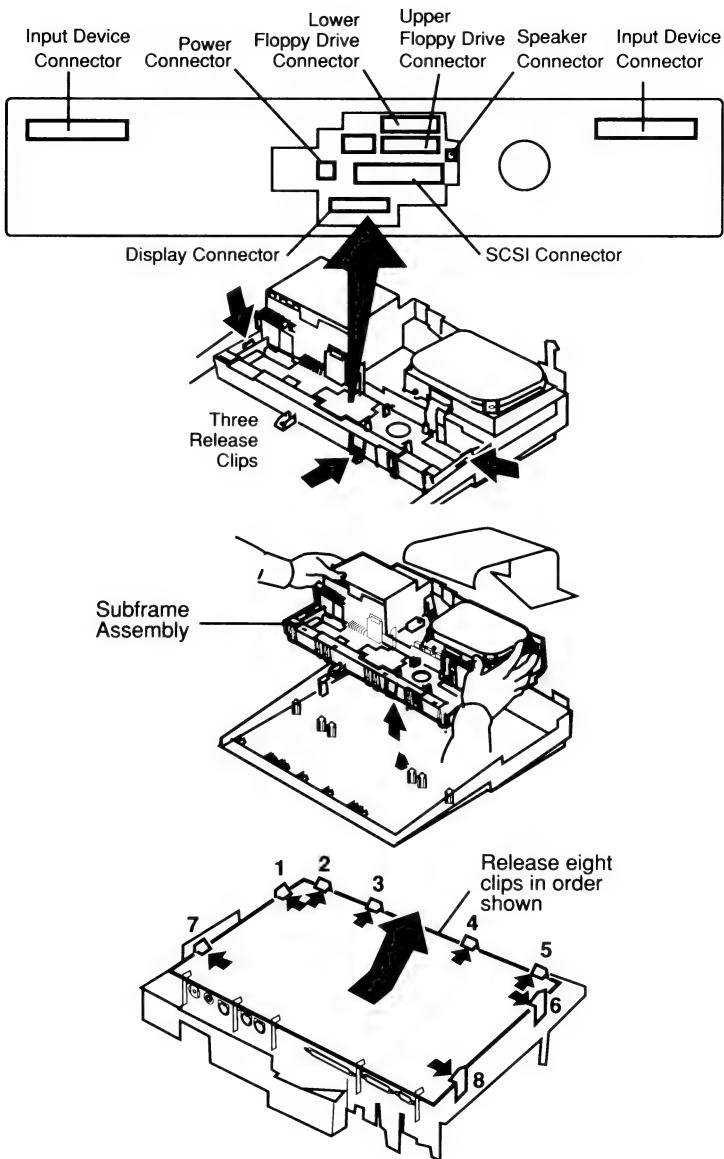


Figure: Removing the Logic Board

Macintosh Portable

Module Replacement



Logic Board

1. Remove the rear cover, main battery, keyboard cover, keyboard/trackball/keypad, display assembly, and option cards. Replace the battery cover.
2. Disconnect all cables (if present, J13-J18 and J20) from the logic board connectors (**see Figure on previous page**).
3. Using a jeweler's screwdriver, release the clips at the left, front center, and right sides of the subframe (**see Figure on previous page**). Lift the subframe slightly after releasing each clip, and then remove the subframe.



CAUTION: When releasing the subframe assembly from the bottom case, be careful not to lift the subframe too far. Lifting the subframe too far could damage the subframe or the logic board.

4. Release the eight plastic clips on the bottom of the subframe **in the order shown**, and separate the logic board from the subframe.



Macintosh Portable

Troubleshooting—Battery

Troubleshooting—Introduction

Before trying other troubleshooting aids, determine whether the Portable is receiving enough power. Perform the battery troubleshooting procedure below.

If the problem is not resolved by the suggestions in battery basics (below), continue troubleshooting by starting up the system and listening for the diagnostic error chords. The diagnostic error chords will indicate major problems with the logic board or battery. If this does not identify all problems, run *MacTest* if the system will boot or run *AppleCAT*® if the system will not boot. (**Note: *MacTest Portable* does not run on Portables with pseudostatic RAM logic boards.**) These diagnostic programs perform identical tests. If the system still doesn't function properly or will not boot, refer to the Symptom/Cure Chart. If the symptom is not listed or is not clearly defined, refer to Troubleshooting—Startup Problems. These flowcharts provide step-by-step procedures for troubleshooting the complete Portable system.

Troubleshooting—Battery Basics

Note: The power adapter by itself cannot provide enough power to operate the Macintosh Portable if the battery is not adequately charged.

1. Connect the power adapter and check the battery level. Even with the power adapter connected, the Portable must be more than 25% charged to operate properly.
2. Make sure the battery cover is completely closed. The Portable will not operate unless the battery cover is closed.
3. Press any key—you may merely have forgotten to wake the Portable up!
4. As a last resort, reset the power manager.
 - Unlock the interrupt and reset switches (**see Figure**).
 - Simultaneously press and hold the reset and interrupt switches, and then release both of them.
 - Again, wake up the Portable by pressing any key.

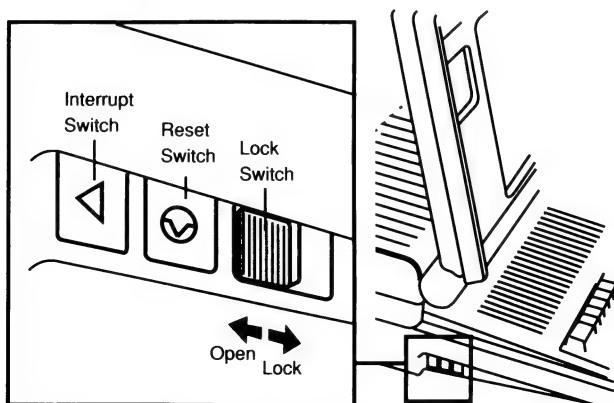


Figure: Resetting the Power Manager

Macintosh Portable

Symptom/Cure Chart



Power Problems

Solutions

Screen is blank;
computer not
responding

1. If computer is new, verify that plastic sheet has been removed from between battery and contacts.
2. Reset power manager.
3. Connect power adapter and try computer again in three or four minutes.
4. Try known-good, charged main battery. If computer now works, replace main battery.
5. Verify that keyboard cable is securely connected at both ends.
6. Replace keyboard.
7. Replace keyboard cable.
8. Replace logic board.

After main
battery removal,
some Control Panel
settings are
different

1. Was battery cover replaced when main battery was removed? If so, power to computer was interrupted and different settings are normal. Restore contents of Control Panel.
2. Replace backup battery.

Power adapter is
plugged in and
connected, but
battery DA does not
indicate charger is
connected

1. Verify that charger is connected properly.
2. Try a different main battery. If battery now charges, replace main battery.
3. Replace power adapter.
4. Replace logic board.

A low-power
warning is
displayed soon
after startup

1. Battery needs recharging. Attach power adapter.
2. Make sure peripherals being used display low-power icon.
3. Reduce use of floppy or hard disk, modem, sound, or other power-consuming devices, or connect power adapter.

Battery needs
recharging after
computer is unused
for four or more days

- If system software is 6.0.4 and AppleTalk is active, using Shutdown command allows serial communications controller (SCC) to draw excess current. To prevent this, select **Sleep** from Special menu or deactivate AppleTalk using Chooser prior to **Shutdown**. Install system software 6.0.5.

Video Problems

Solutions

Some pixels never
come on (blacken);
no pattern

- A maximum number of five permanently OFF pixels (voids) is considered acceptable. If display contains six or more voids, replace LCD display.

Some pixels are
always black;
no pattern
A row of pixels

- If any pixel remains on constantly, replace LCD display.
1. Replace LCD display.



Macintosh Portable

Symptom/Cure Chart

| | |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| never blackens | <ol style="list-style-type: none">2. Replace display cable.3. Replace logic board. |
| A row of pixels is always black (black streaks) | <ol style="list-style-type: none">1. Replace LCD display.2. Replace display cable.3. Replace logic board. |
| No display, but computer appears to be operating correctly | <ol style="list-style-type: none">1. Verify that display cable is securely connected.2. Replace LCD display.3. Replace display cable.4. Replace logic board. |
| Display looks blurred | <ol style="list-style-type: none">1. Adjust angle of display.2. Adjust screen contrast setting using Control Panel. |
| Display looks dark (nonbacklit display) | <ol style="list-style-type: none">1. Not enough light is available. Locate computer closer to direct light or move light source closer to computer.2. Adjust screen contrast setting using Control Panel.3. Replace LCD display.4. Replace logic board. |
| Display is too light (nonbacklit display) | <ol style="list-style-type: none">1. Adjust angle of display.2. Adjust screen contrast setting using Control Panel.3. Replace LCD display. |
| Backlight level cannot be changed | <ul style="list-style-type: none">– Verify that version 1.3 of the Portable CDEV is present. Earlier versions do not support the backlight feature. (To check the version of the CDEV, select the file named Portable in the system folder and select Get Info from the File menu.) |
| Backlight does not operate | <ol style="list-style-type: none">1. Verify that version 1.3 of the Portable CDEV is present. Earlier versions do not support the backlight feature. (To check the version of the CDEV, select the file named Portable in the system folder and select Get Info from the File menu.)2. Check inverter PCA connections.3. Replace inverter PCA.4. Replace LCD display.5. Replace logic board. |

Disk Drive Problems Solutions

| | |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Audio and video present, but internal drive does not operate | <ol style="list-style-type: none">1. Try different floppy disk.2. Replace floppy disk drive.3. Replace floppy disk drive cable.4. Replace logic board. |
| Disk ejects while booting; display shows Mac icon with blinking "X" | <ol style="list-style-type: none">1. Try known-good system disk.2. Replace floppy disk drive.3. Replace floppy disk drive cable.4. Replace logic board. |

continued...

Macintosh Portable

Symptom/Cure Chart



Disk Drive Problems Solutions (continued)

- | | |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Disk will not eject | <ol style="list-style-type: none">1. Shut down computer, press and hold down trackball or mouse button, and switch on computer.2. Eject disk manually by pushing opened paper clip into bottom case hole located near disk drive.3. Replace floppy disk drive.4. Replace floppy disk drive cable.5. Replace logic board. |
| Disk initialization fails | <ol style="list-style-type: none">1. Verify that Apple-certified media are being used.2. Try different disk.3. Replace floppy disk drive.4. Replace logic board. |

SCSI Drive Problems Solutions

- | | |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internal hard disk will not operate | <ol style="list-style-type: none">1. Verify that external SCSI devices are switched on and SCSI hard drive cable is securely connected.2. Use HD SC Setup to see if drive is visible. If it is, reinitialize drive.3. Replace hard disk drive.4. Replace logic board. |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Peripheral Problems Solutions

- | | |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| After connecting external SCSI device, computer no longer boots | <ol style="list-style-type: none">1. Turn on external SCSI device before starting up computer.2. Verify that proper cable termination is provided.3. Verify that no two SCSI devices have same device address.4. Replace logic board. |
| Cursor does not move when using trackball | <ol style="list-style-type: none">1. Reset power manager.2. Check cable connections between trackball and logic board.3. Replace trackball cable.4. Replace trackball.5. Replace logic board. |
| Cursor does not move when using mouse | <ol style="list-style-type: none">1. Check mouse connection to ADB port.2. Reset power manager.3. Clean mouse ball and inside mouse case. (Refer to You Oughta Know tab in <i>Apple Service Technical Procedures</i>.)4. Replace mouse.5. Replace logic board. |
| Cursor intermittently does not move or moves erratically | <ol style="list-style-type: none">1. Clean trackball ball and internal rollers.2. Replace trackball. |



Macintosh Portable

Symptom/Cure Chart

Device connected to modem port doesn't work

1. Verify that **External Modem** is selected in Portable CDEV.
2. If using System 6.0.4, upgrade to 6.0.5 or later.
3. Replace logic board.

Cursor moves, but clicking button has no effect

1. If trackball button is not working, replace trackball cable. If mouse button is not working, replace mouse.
2. Replace trackball.
3. Replace logic board.

No response to any key on keyboard

1. If screen is blank and you are trying to bring computer out of system sleep, try resetting power manager.
2. Check keyboard connection to logic board.
3. Replace keyboard.
4. Replace logic board.

Known-good ImageWriter, ImageWriter II, or LQ will not print

1. Make sure System 6.0.5 or later is being used.
2. Make sure Chooser is set correctly.
3. Replace printer cable.
4. Replace logic board.

Known-good LaserWriter will not print

1. Make sure System 6.0.5 or later is being used.
2. Make sure Chooser is set correctly.
3. Try another printer. If that printer works, computer is OK. Refer to *Networks* tab in *Apple Service Technical Procedures*.
4. Replace logic board.

Serial devices are unrecognized or garbage is transmitted and/or received

1. If System 6.0.4 is being used, be sure Macintosh Portable INIT 1.0 is installed in system folder.
2. Upgrade to System 6.0.5 or later.

When using external modem: After exiting communication program and putting Portable to sleep three or four times, computer locks up when coming out of system sleep

- If System 6.0.4 is being used, upgrade to System 6.0.5 or later.

Internal Modem Problems

Solutions

Internal modem options do not appear in Portable CDEV when modem is installed

1. Try removing and reseating card.
2. Replace modem card.
3. Replace logic board.

continued...

Macintosh Portable

Symptom/Cure Chart



Internal Modem Problems (cont'd)

Solutions

Modem interferes with system sound

1. Replace modem card.
2. Replace logic board.

Modem does not respond properly to AT command set instructions

1. Check baud rate and data format settings. Are they compatible with Portable Data Modem 2400 and remote modem?
2. Replace modem card.

Modem does not respond to incoming call

1. If system does not respond to incoming call during sleep mode, verify that **When Phone Rings** option in Automatic Wake-Up section of Portable CDEV is selected.
2. Replace modem card.
3. Replace logic board.

Modem has no sound output

- Replace modem card.

Miscellaneous Problems

Solutions

Screen goes blank and computer shuts down every few minutes

- Computer is going into system sleep to conserve battery power. Adjust sleep delays in Control Panel or connect power adapter.

Some applications seem to run slower after running for a few seconds

- Computer is switching to system rest. To disable system rest, open Control Panel, hold down <Option> key, and click **Minutes Until Automatic Sleep**. When dialog box appears, click **Don't Rest**.

Hard disk is slow to respond or screen goes blank too often

- The computer is powering down hard disk or going into system sleep to conserve battery power. Adjust sleep delays in Control Panel or connect power adapter.

No sound from speaker

1. Verify that volume setting in the Control Panel is 1 or above.
2. Check speaker connection to logic board.
3. Replace speaker.
4. Replace logic board.

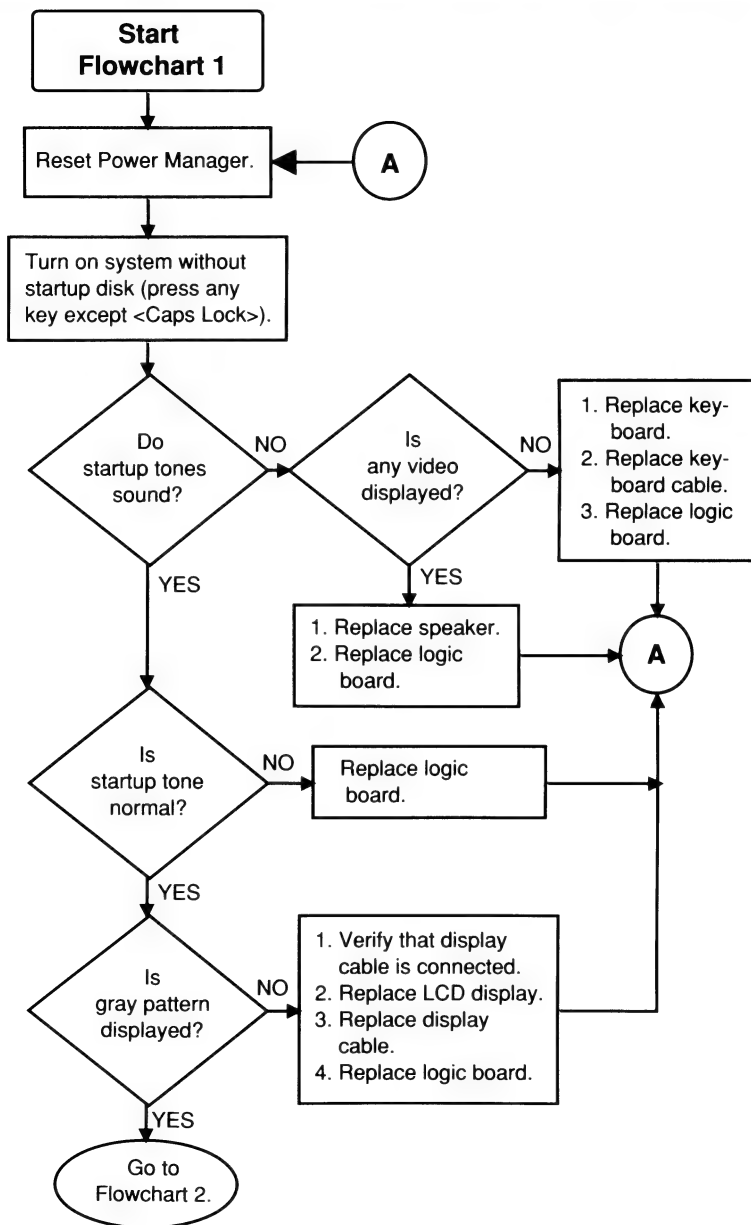
Screen suddenly goes blank

- Computer has gone into system sleep to conserve battery power.



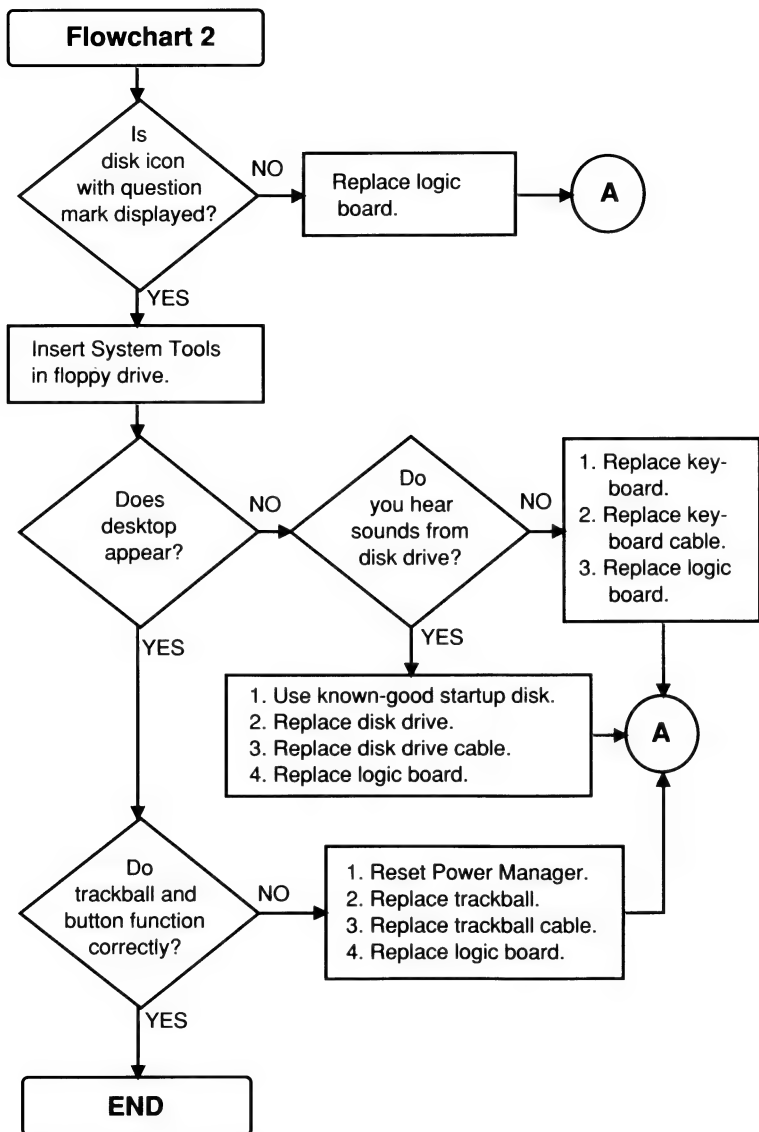
Macintosh Portable

Troubleshooting—Startup Problems



Macintosh Portable

Troubleshooting—Startup Problems





Macintosh Portable

Logic Board

The logic board for the original Macintosh Portable (with static RAM) and the logic board for the new Portable (with pseudostatic RAM) *are not interchangeable*. The pseudostatic logic board has eight soldered RAM chips; the logic board with static RAM has thirty-two soldered chips.

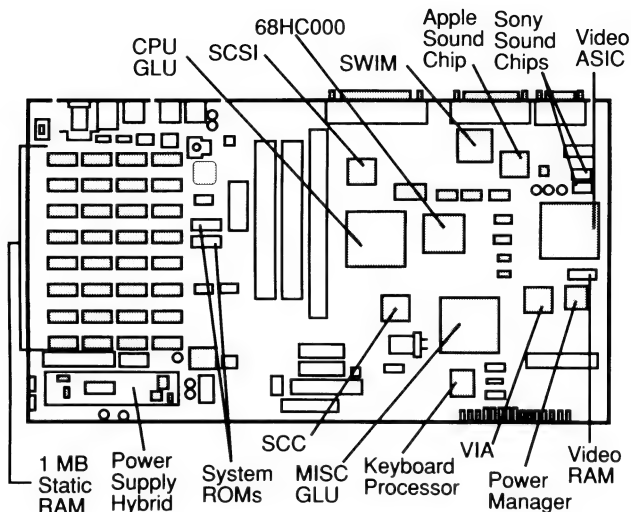


Figure: Logic Board Components (Original Logic Board Shown)

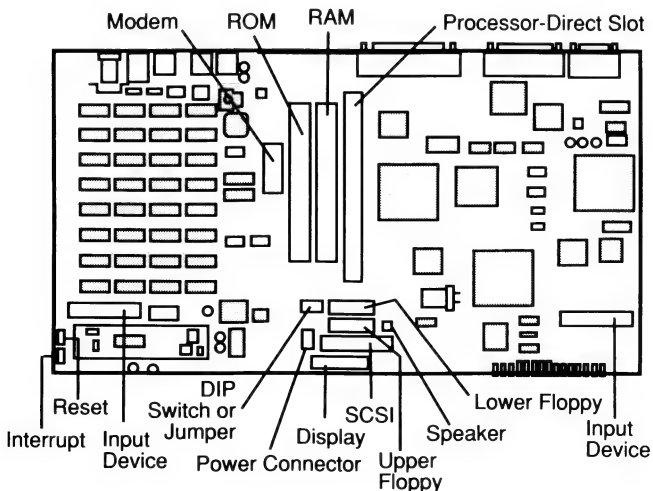


Figure: Internal Connectors and Switches

Macintosh Portable

Portable Data Modems



Installation and Verification Procedure

The following procedure covers the installation and verification of the internal, Macintosh Portable Data Modem 2400 and the Intl. XP 2400.

1. Unplug the power adapter, and remove the rear cover and main battery.
2. Remove the modem cap by pushing it through the rear of the computer.
3. Install the modem card in the modem connector. Make sure the modem card is on the right side of the modem gasket.
4. Replace the main battery and rear cover, and turn on the computer.
5. Use *ModemTest* to verify that the computer and modem are communicating, and AppleLink to verify operation of the modem with the telephone network. (For additional information, refer to Section 4, Diagnostics, under the Modems tab in *Apple Service Technical Procedures*.)

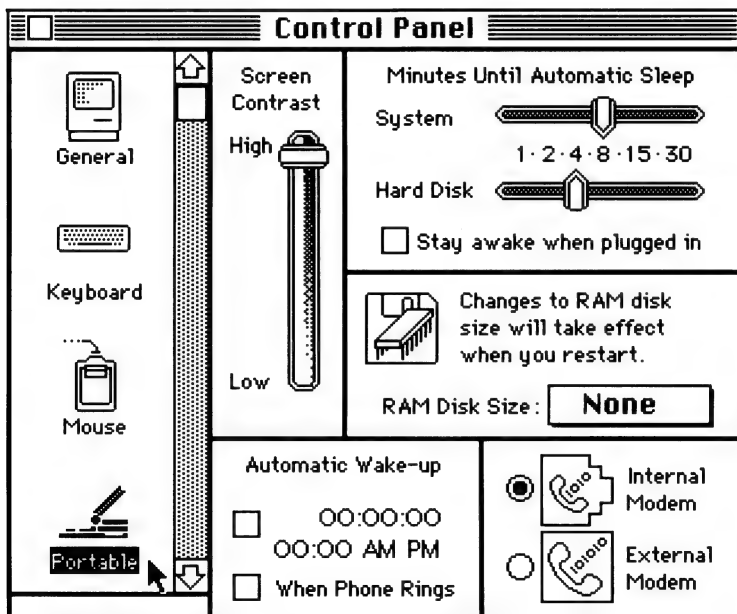


Figure: Verifying Correct Modem Installation



Macintosh Portable

Memory Upgrades

Installation Procedure

1. Place the Macintosh Portable on a grounded workstation mat and put on your grounding wriststrap.
2. Unplug the power adapter, and remove the rear cover and main battery.
3. Replace the main battery cover.



CAUTION: The 1 MB static RAM and the 1 MB and 3 MB pseudostatic RAM expansion cards are *not interchangeable*. Never install a static RAM card (unkeyed) on the new pseudostatic logic board (keyed connector).

4. Locate the RAM expansion connector (see Figure D). If the connector is **keyed**, you must install a pseudostatic RAM expansion card (see the cards in Figures B and C below).
5. Position the static (not keyed) or pseudostatic (keyed) expansion card over the connector and plug in the card (see Figure D).
6. Remove the battery cover and replace the main battery.
7. Replace the rear cover.

Troubleshooting the Installation

1. Turn on the computer by pressing any key except <Caps Lock>.
2. Pull down the Apple menu and select **About the Finder™**.
3. Check that the amount of RAM indicated is 2048K (1 MB card) or 4096K (3 MB card). If the amount of RAM is not correct:
 - Check that correct card (static or pseudostatic) is installed.
 - If the card is correct but the amount of RAM is *not*, replace the card.
 - If the amount of RAM indicated is *still not* correct, replace the logic board.

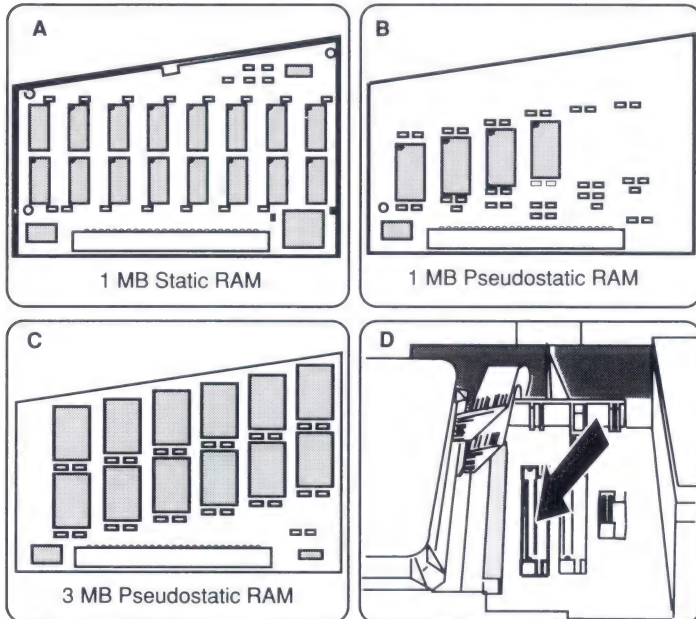
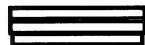


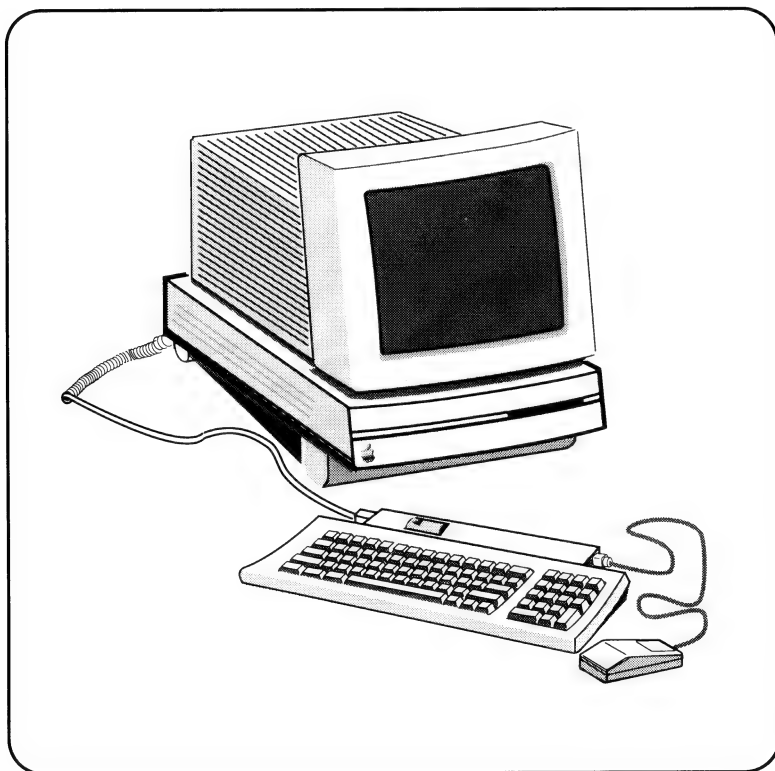
Figure: Installing Static or Pseudostatic RAM Expansion Cards

Macintosh LC

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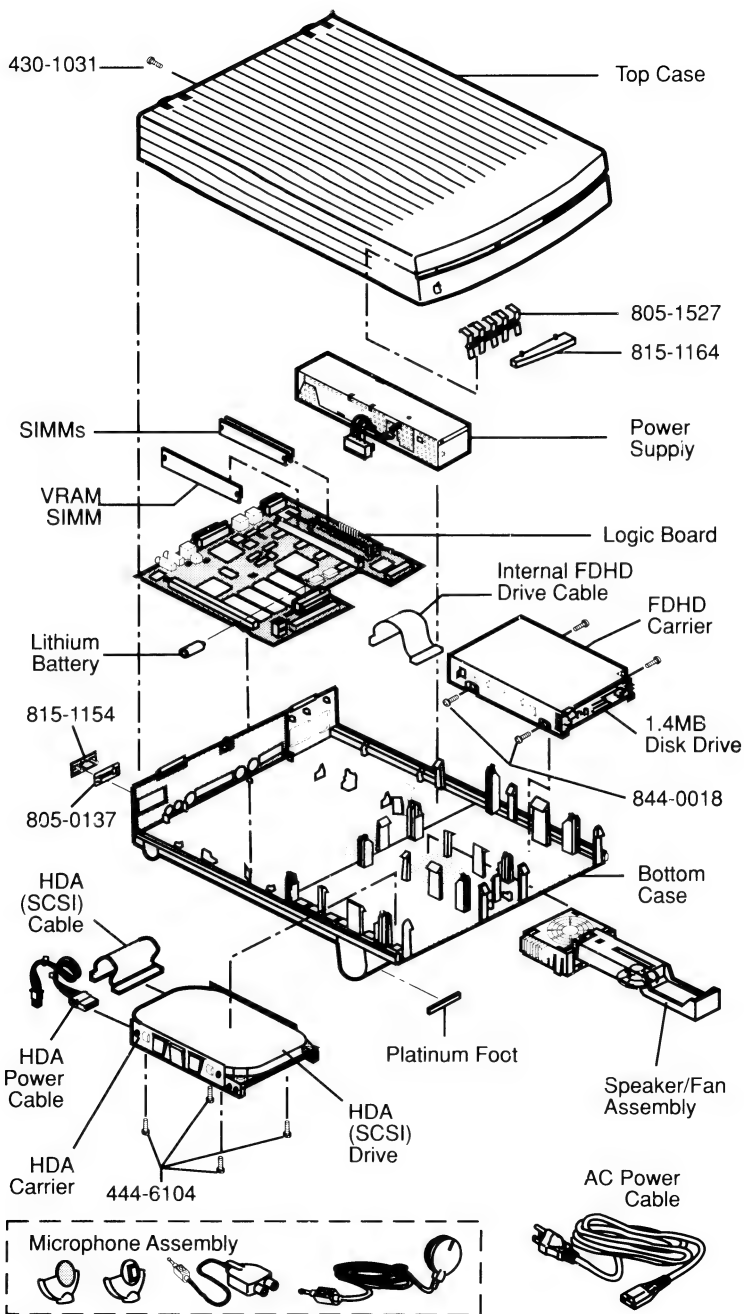
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Macintosh LC

Exploded View





| | |
|-----------------------------------------------|----------|
| Bottom Case | 630-0500 |
| Access Cover | 815-1154 |
| Access Cover Shield | 805-0137 |
| Platinum Foot | 865-0066 |
| Cable, AC Power (smoke) | 590-0380 |
| Disk Drive, Apple 3.5, 1.4 MB FDHD/SuperDrive | 661-0474 |
| Cable, Internal FDHD Drive | 590-0524 |
| FDHD Carrier | 805-5111 |
| Screw, FDHD Carrier to FDHD | 844-0018 |
| HDA, 40 MB, 1" Internal 3.5 SCSI | 661-0614 |
| Cable, HDA Power | 590-0303 |
| Cable, Internal HDA (SCSI Connector Cable) | 590-0228 |
| HDA Carrier | 805-0980 |
| Screw, 6-32 x .250 (HDA to HDA Carrier) | 444-6104 |
| Keyboard II* | 661-0603 |
| Lithium Battery (without leads) | 742-0011 |
| Logic Board | 661-0593 |
| SIMM, 1 MB, 120 ns | 661-0403 |
| SIMM, DIP, 1 MB, 120 ns | 661-0410 |
| VRAM SIMM, 256K, 100 ns | 661-0609 |
| Microphone Assembly | 699-5071 |
| Mouse, Apple Desktop Bus* | 661-0479 |
| Power Supply | 661-0594 |
| Speaker/Fan Assembly | 630-5058 |
| Top Case | 630-0505 |
| Cover Screw | 430-1031 |
| Disk Drive Slot Cover | 815-1164 |
| Disk Drive Slot Cover Shield | 805-1527 |

*For additional ADB devices and part numbers, see General Information.

Symptom / Cure Chart

System Problems

Solutions

Does not power on—screen is black, fan is not running, and LED is not lit

1. Check cables.
2. Plug monitor directly into wall socket, and verify that monitor has power.
3. Replace power cord.
4. Replace power supply.
5. Replace logic board. Retain customer's SIMMs.

System shuts down intermittently

1. Make sure air vents on top and sides of cover are clear. Thermal protection circuitry may shut down system. After 30-40 minutes, system should be OK.
2. Replace power cable.
3. Replace power supply.
4. Replace logic board. Retain customer's SIMMs.

Clicking, chirping, or thumping sound

1. Replace power supply.
2. Disconnect hard disk; replace if noise disappears.
3. Replace logic board. Retain customer's SIMMs.

continued...



Macintosh LC

Symptom/Cure Chart

System Problems (continued)

Solutions

System intermittently crashes or locks up

1. Make sure the System is version 6.0.7 or higher.
2. Make sure application software is known-good.
3. Replace system software.
4. Replace logic board. Retain customer's SIMMs.
5. Replace SIMMs.
6. Replace power supply.

System intermittently does not power on

1. Check cables.
2. Plug monitor directly to wall socket and verify that monitor has power.
3. Replace power cord.
4. Replace power supply.
5. Replace logic board. Retain customer's SIMMs.

System seems to boot, then message "Finder is old version" displays

1. Clear parameter RAM. Hold down **<Command>** **<Option>** **<p>** **<r>** keys and reboot system. You will hear normal startup chords and about two seconds later you will hear another chord. This means parameter RAM has been cleared.
2. Replace logic board. Retain customer's SIMMs.

Video Problems

Solutions

Screen is completely dark, fan is not running, and LED is not lit

1. Plug monitor directly into wall socket, and verify that monitor has power.
2. Remove expansion card, if installed.
3. Remove any external peripherals, if attached.
4. Replace logic board. Retain customer's SIMMs.
5. Replace power supply.

Screen is dark, no audio, no drive, but fan is running and boot tone is normal

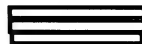
1. Adjust brightness on monitor.
2. Replace monitor.
3. Replace video cable.
4. Replace video RAM SIMM.
5. Replace SIMMs.
6. Replace logic board. Retain customer's SIMMs.
7. Replace power supply.

Vertical or horizontal lines or snow appear on screen, or screen is completely dark, and boot tone is normal

1. Replace monitor.
2. Replace video cable.
3. Replace video RAM SIMM.
4. Replace logic board. Retain customer's SIMMs.
5. Replace power supply.

Partial or whole screen is bright and audio is present, but no video information is visible

1. Replace monitor.
2. Replace video cable.
3. Replace logic board. Retain customer's SIMMs.



Screen is dark,
audio and drive
operate, fan is
running, and LED
is lit

1. Adjust brightness on monitor.
2. Replace monitor.
3. Replace video cable.
4. Replace SIMMs.
5. Replace logic board.
6. Replace power supply.

Note: If replacing the monitor corrects the problem, refer to the appropriate Apple Service Technical Procedures to obtain monitor replacement information.

Drive Problems

Solutions

Audio and video are
present, but
internal drive does
not operate

1. Replace bad disk.
2. Verify that all external SCSI devices are disconnected.
3. Replace internal disk drive cable.
4. Replace internal disk drive.
5. Replace logic board. Retain customer's SIMMs.
6. Replace power supply.

Disk ejects; display
shows icon with
blinking "X"

1. Replace disk with known-good system disk.
2. Replace internal disk drive cable.
3. Replace internal disk drive.
4. Replace logic board. Retain customer's SIMMs.

Will not eject disk

1. Switch power off and hold mouse button down while switching power back on.
2. Eject disk manually by pushing opened paper clip into hole beside the drive slot.
3. Replace disk drive.

System attempts
to eject disk
but cannot

1. Try pushing disk completely back in.
2. Eject disk manually by pushing opened paper clip into hole beside the drive slot.
3. Replace disk drive.

SCSI Problems

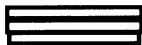
Solutions

Internal hard drive
runs continuously

1. Replace HDA cable.
2. Replace hard drive.
3. Replace logic board. Retain customer's SIMMs.

Internal hard drive
will not operate

1. Replace HDA cable.
2. Replace HDA power cable.
3. Replace hard drive.
4. Replace logic board. Retain customer's SIMMs.



Macintosh LC

Symptom/Cure Chart

| Peripheral Problems | Solutions |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Works with internal or external SCSI device but will not work with both | <ol style="list-style-type: none">1. Check that switch setting of external SCSI device is different priority from that of internal device.2. Replace terminator on external device.3. Verify that terminator is installed on internal SCSI drive.4. Replace SCSI device select cable. |
| Cursor does not move | <ol style="list-style-type: none">1. Reboot system.2. Check mouse connection.3. If mouse was connected to a keyboard, connect it to the rear ADB port. If mouse works, replace keyboard.4. If mouse does not work in ADB port, replace mouse.5. Replace logic board. Retain customer's SIMMs. |
| Cursor moves but clicking the mouse button has no effect | <ol style="list-style-type: none">1. Replace mouse.2. Replace logic board. Retain customer's SIMMs. |
| No response to any key on the keyboard | <ol style="list-style-type: none">1. Make sure the System is version 6.0.7 or higher.2. Check keyboard connection to ADB port.3. Replace keyboard cable.4. Replace keyboard.5. Replace logic board. Retain customer's SIMMs. |
| Known-good ImageWriter or ImageWriter II will not print | <ol style="list-style-type: none">1. Make sure that Chooser and Control Panel are set correctly.2. Make sure the System is version 6.0.7 or higher.3. Replace printer interface cable.4. Replace logic board. Retain customer's SIMMs. |
| Known-good LaserWriter will not print | <ol style="list-style-type: none">1. Make sure that Chooser and Control Panel are set correctly.2. Make sure the System is version 6.0.7 or higher.3. Refer to <i>Networks</i> tab in <i>Apple Service Technical Procedures</i> for more information. |
| Cannot double-click to open an application, disk, or server | <ol style="list-style-type: none">1. Remove duplicate system files on hard disk.2. Clear parameter RAM. Hold down <Shift> <Option> <Command> keys and select Control Panel from Apple menu. Reset mouse controls.3. If mouse was connected to keyboard, connect it to rear ADB port. If mouse works, replace keyboard.4. If mouse does not work in the ADB port, replace mouse.5. Replace logic board. Retain customer's SIMMs. |

Macintosh LC

Logic Board Components



Miscellaneous Problems

Solutions

No sound from speaker

1. Verify that volume setting in the Control Panel is set to 1 or above.
2. Replace speaker.
3. Replace logic board. Retain customer's SIMMs.

Clock not running

1. Replace battery.
2. Replace logic board. Retain customer's SIMMs.

Macintosh LC Logic Board Components

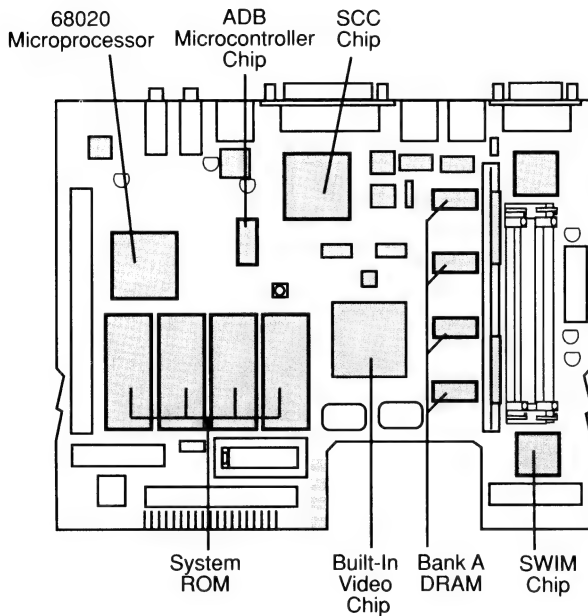
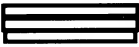


Figure: Macintosh LC Logic Board Components



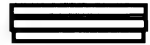
Macintosh LC

Specifications

| Macintosh LC Specifications | |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68020, 32-bit internal architecture 16 MHz clock speed Burst mode RAM access 256-byte instruction and data caches |
| Expansion Connector | 96-pin processor-direct slot supporting 020 Direct Slot expansion card |
| Memory | 2 MB expandable to 10 MB (100 ns or faster SIMMs) 512K ROM standard 256K VRAM (video RAM) SIMM, upgradeable to 512K VRAM SIMM |
| Built-in Video Support | Apple High-Resolution Monochrome Monitor AppleColor High-Resolution RGB Monitor Macintosh 12-Inch RGB Display Macintosh 12-Inch Monochrome Display |
| Interfaces | Two RS-232/RS-422 serial ports SCSI interface (50-pin internal connector and DB-25 external connector) One Apple Desktop Bus (ADB) port One DB-15 monitor port for built-in video Monophonic sound-out port Sound input port for monaural sound input |
| Internal Storage | Built-in 1.4 MB FDHD SuperDrive Optional second FDHD SuperDrive Internal Hard Disk 40SC Optional internal Hard Disk 80SC |
| Sound | Monaural 8-bit sound input with Macintosh Audio Compression Expansion (MACE) sound utility supporting 3:1 or 6:1 compression Monophonic 8-bit sound generator supplying same signal to both channels of stereo equipment Omnidirectional electret microphone |
| Electrical | Line voltage: 100 to 240 volts AC, automatically configured Frequency: 50 to 60 Hz Maximum power: 50 watts, not including monitor |

Macintosh LC

Memory Upgrade



The Macintosh LC comes with 2 megabytes of RAM soldered to the logic board in Bank A, and has two SIMM slots for expansion memory (**see Figure**). System memory can be expanded to 10 megabytes, but only 1 MB RAM SIMMs are currently available for the Macintosh LC (**the Macintosh LC does not support 256K SIMMs**). To expand system memory, both expansion slots must be filled with SIMMs of the same size. You can mix SIMMs of different speeds, as long as both SIMMs are 100 ns or faster.

Note: Be sure to use the SIMM removal tool when removing SIMMs from the logic board. See the Special Tools Index in the General Information tab section.

Upgrades

| RAM | Bank A | SIMM Sockets |
|------|-------------------|----------------|
| 2 MB | 2 MB soldered RAM | Empty |
| 4 MB | 2 MB soldered RAM | Two 1 MB SIMMs |

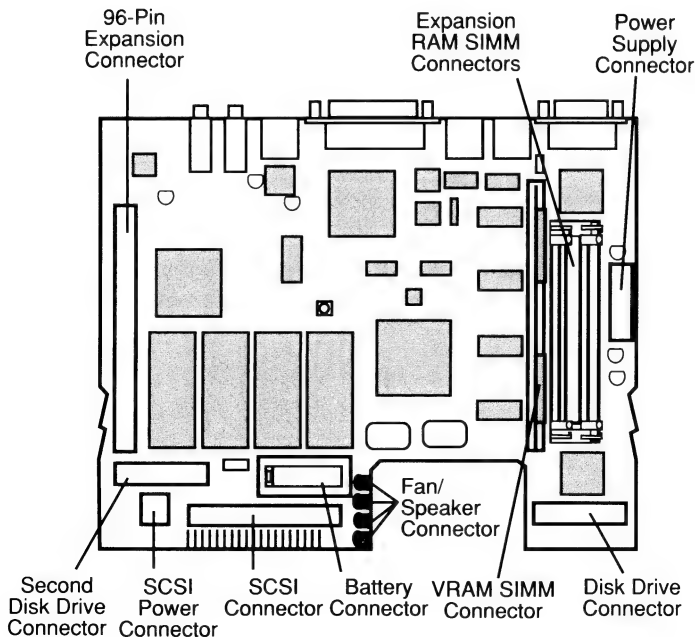


Figure: Macintosh LC Internal Connectors

Macintosh II, IIx, and IIcx

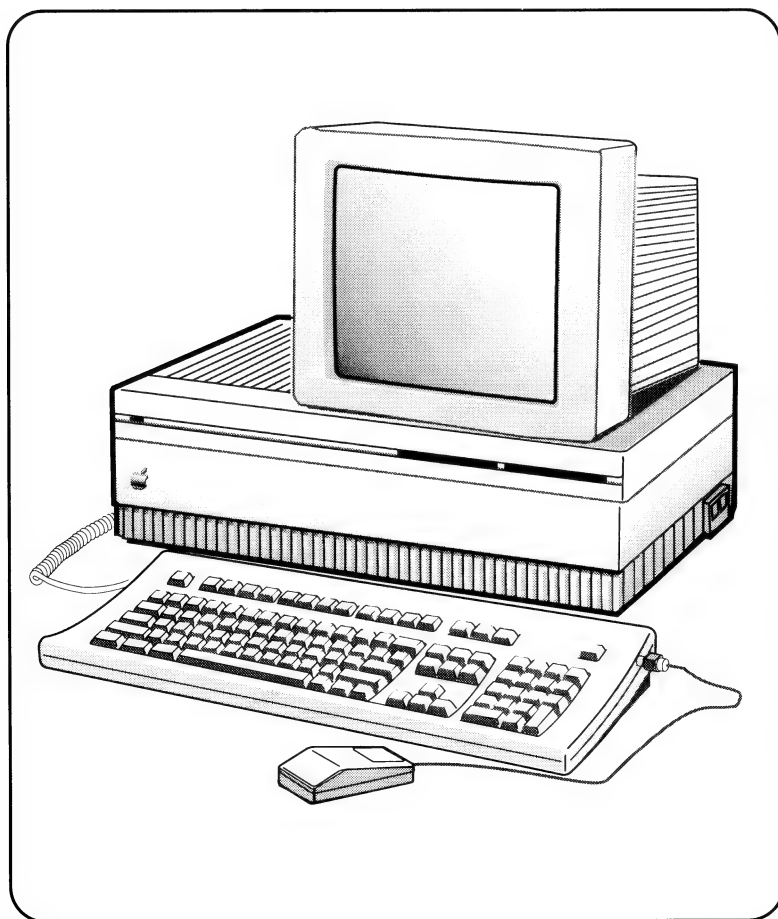
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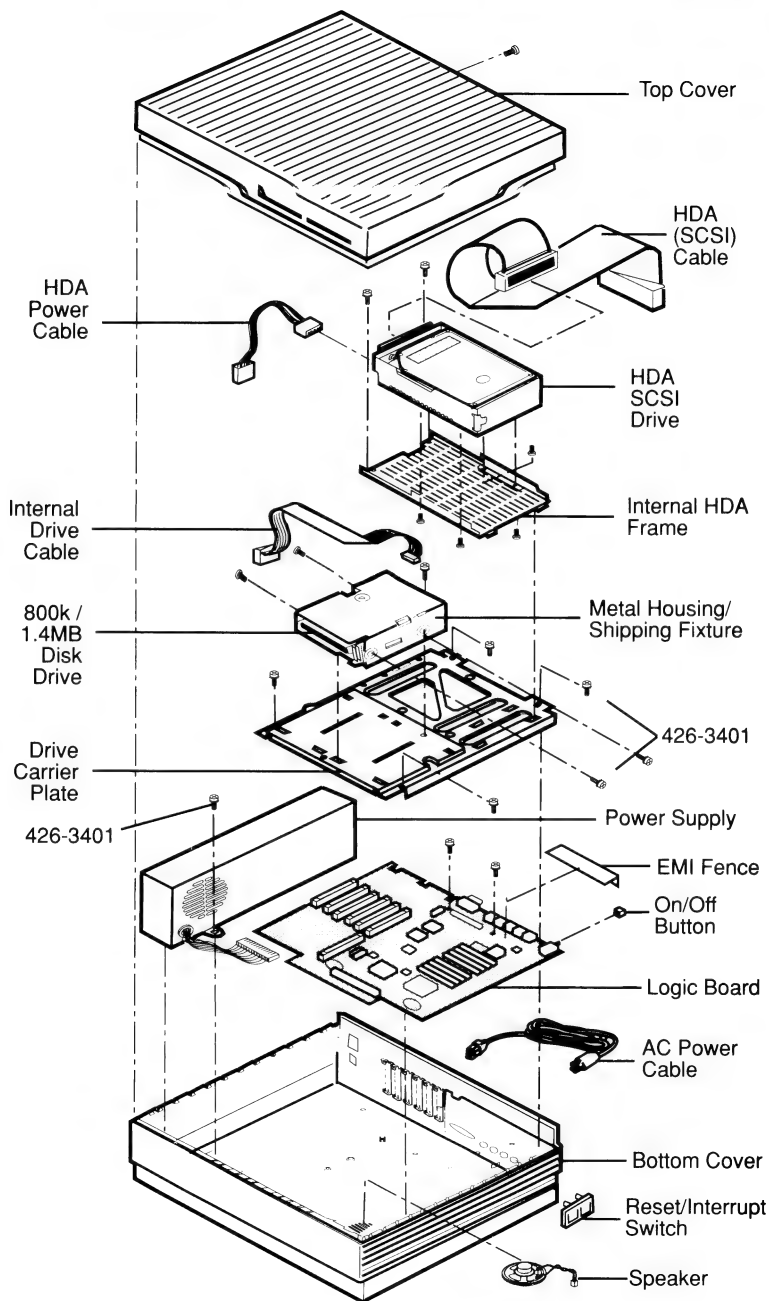
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Macintosh II, IIfx, and IIfx

Exploded View



II, IIfx, & IIfx

Macintosh II, IIx, and IIfx

Parts List



| | |
|-------------------------------------------------------------------|----------|
| Bottom Cover Assembly, Macintosh II | 630-5227 |
| Bottom Cover Assembly, Macintosh IIx | 630-5494 |
| Bottom Cover Assembly, Macintosh IIfx | 630-5806 |
| Reset/Interrupt Switch | 815-6024 |
| Speaker | 630-5222 |
| Cable, AC Power (smoke) | 590-0380 |
| Disk Drive, Apple 3.5, 800K Mechanism | 661-0345 |
| Disk Drive, Apple FDHD SuperDrive, 1.4 MB Mechanism | 661-0474 |
| Disk Drive Parts, 800K & 1.4 MB Drives | |
| Cable, 800K or 1.4 MB 3.5 Drives (red or yellow stripe) | 590-0188 |
| Internal Drive Shield, 800K (for transporting) | 805-0217 |
| Metal Housing/Shipping Fixture (for transporting) | 805-5050 |
| Packing Disk, 2-Sided (for transporting 800K Mechanisms) | 003-0003 |
| Screw, M 3 x 6, with two washers | 462-3401 |
| Drive Carrier Plate | 805-5062 |
| Extended Keyboard* | 661-0384 |
| HDA, 20 MB, Internal 3.5 SCSI, Rev. A | 661-0373 |
| HDA, 20 MB, Internal 3.5 SCSI, Rev. B | 661-0612 |
| HDA, 40 MB, Internal 3.5 SCSI | 661-0464 |
| HDA, 80 MB, Internal 3.5 SCSI | 661-0600 |
| HDA, 80 MB, Int. 3.5 SCSI with A/UX® v.1.1 (replaced by 661-0613) | 661-0561 |
| HDA, 80 MB, Internal 3.5 SCSI with A/UX, v.2.0 | 661-0613 |
| HDA, 40 MB, Internal 5.25 SCSI | 661-0391 |
| HDA, 80 MB, Internal 5.25 SCSI | 661-0411 |
| HDA, 80 MB, Internal 5.25 SCSI with A/UX, v.1.0 | 661-0457 |
| HDA, 160 MB, Internal 5.25 SCSI | 661-0601 |
| HDA Parts | |
| Cable, HDA Internal (SCSI Connector Cable) | 590-0566 |
| Cable, HDA Power, Macintosh II/IIx | 590-0364 |
| Cable, HDA Power (2 x 2 pin), Macintosh IIfx | 590-0512 |
| Internal HDA Frame, 3.5 Drive | 805-5066 |
| Internal HDA Frame, 5.25 Drive | 805-5051 |
| Screws, M 3.5 x .6 x 8, PNCRS Rec | 462-4100 |
| Keyboard, Regular Apple* | 661-0383 |
| Logic Board, Macintosh II (w/o RAM; replaces 661-0374) | 661-0528 |
| Battery Holder Board | 600-0530 |
| IC, IWM | 344S0043 |
| IC, SWIM | 344S0062 |
| IC, HMMU | 343-0002 |
| IC, PMMU | 630-8221 |
| ROM, Low, Macintosh II FDHD Upgrade | 661-0642 |
| ROM, Med Low, Macintosh II FDHD Upgrade | 661-0641 |
| ROM, Med High, Macintosh II FDHD Upgrade | 661-0640 |
| ROM, High, Macintosh II FDHD Upgrade | 661-0639 |
| SIMM, 256K, 120 ns | 661-0402 |
| SIMM, DIP, 256K, 120 ns | 661-0494 |
| SIMM, 1 MB, 120 ns | 661-0403 |
| SIMM, DIP, 1 MB, 120 ns | 661-0410 |

*For additional ADB input devices and part numbers, see General Information.

continued...



Macintosh II, IIx, and IIfx

Parts List & Symptom/Cure Chart

| | |
|-------------------------------------------------------------------|----------|
| Logic Board, Macintosh IIx (w/o RAM; replaces 661-0463) | 661-0529 |
| Battery Holder Board | 600-0530 |
| SIMM, 256K, 120 ns | 661-0402 |
| SIMM, DIP, 256K, 120 ns | 661-0494 |
| SIMM, 1 MB, 120 ns | 661-0403 |
| SIMM, DIP, 1 MB, 120 ns | 661-0410 |
| Logic Board, Macintosh IIfx (w/o RAM) | 661-0522 |
| Battery Holder Cover | 520-0344 |
| Internal SCSI Termination Block | 590-4515 |
| Internal SCSI Filter | 590-4516 |
| SIMM, 1 MB, SOJ, 80 ns, 64-pin | 661-0548 |
| Logic Board, Parity, Macintosh IIfx (w/o RAM) | 661-0592 |
| Battery Holder Cover | 520-0344 |
| SIMM, 1 MB, SOJ, 60 ns, 64-pin, Parity | 661-0549 |
| Logic Board Parts | |
| EMI Fence | 805-5070 |
| Lithium Battery (w/o leads; replaces 742-0009) | 742-0011 |
| On/Off Button | 815-6237 |
| Screws (logic board mounting) | 462-4100 |
| Mouse, ADB (replaces 661-0338)* | 661-0479 |
| Power Supply, Macintosh II/IIx | 661-0375 |
| Power Supply, Macintosh IIfx | 661-0542 |
| Top Cover and Latch Assembly | 630-5229 |
| Disk Slot Plug Assembly | 630-5302 |

***For additional ADB input devices and part numbers, see General Information.**

Symptom/Cure Chart

| System Problems | Solutions |
|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Does not power on, screen is black, fan is not running, and LED is not lit | <ol style="list-style-type: none">1. Check cables.2. Plug monitor directly into wall socket, and verify that monitor has power.3. Replace power cord.4. Check batteries. Replace both batteries if either battery is below 3.2 volts.5. Replace power supply.6. Replace logic board. Retain customer's SIMMs. |
| Clicking, chirping, or thumping sound | <ol style="list-style-type: none">1. Replace power supply.2. Replace logic board. Retain customer's SIMMs. |
| System intermittently crashes or locks up | <ol style="list-style-type: none">1. Make sure system software is correct version.2. Make sure all software is known-good.3. Replace SIMMs.4. Replace logic board. Retain customer's SIMMs.5. Replace power supply. |



System shuts down
intermittently

1. Check that air vents on sides and top of main unit are clear. Thermal protection circuitry may shut system down. After 30 to 40 minutes, system should be OK.
2. Replace power cord.
3. Check batteries. Replace both batteries if either battery is below 3.2 volts.
4. Replace power supply.
5. Replace logic board. Retain customer's SIMMs.

System
intermittently
crashes or locks up

1. Make sure correct version of system software is being used.
2. Make sure all software is known-good.
3. Replace SIMMs.
4. Replace logic board. Retain customer's SIMMs.
5. Replace power supply.

System sounds error
chords at startup
(Macintosh IIcx only)

1. Check for Apple-labeled SIMMs manufactured by NEC. Replace any NEC SIMMs that have a date code of 9052 or lower.
2. See Startup Problems—Flowchart 2 in the On-Site Troubleshooting tab.

System does not
boot (Macintosh IIcx
only)

- Check for Apple-labeled SIMMs manufactured by NEC. Replace any NEC SIMMs that have a date code of 9052 or lower.

Video Problems

Solutions

Screen is black,
audio and drive
operate, fan is
running, and LED
is lit

1. Adjust brightness on monitor.
2. Replace monitor.
3. Replace video cable.
4. Move video card to different slot.
5. Replace video card.
6. Replace SIMMs.
7. Replace logic board.
8. Replace power supply.

Partial or whole
screen is bright and
audio is present, but
no video information
is visible

1. Replace monitor.
2. Replace video cable.
3. Move video card to different slot.
4. Replace video card.
5. Replace logic board. Retain customer's SIMMs.

Screen is black,
audio and drive do
not operate, but
fan is running and
LED is lit

1. Replace video cable.
2. Move video card to different slot.
3. Replace video card.
4. Replace SIMMs.
5. Replace logic board.
6. Replace power supply.
7. Replace monitor.

continued...



Macintosh II, IIx, and IIfx

Symptom/Cure Chart

Video Problems (continued)

Solutions

Screen is completely dark, fan is not running, and LED is not lit

1. Plug monitor directly into wall socket and verify that monitor has power.
2. Check batteries. Replace both batteries if either battery is less than 3.2 volts.
3. Replace power supply.
4. Replace logic board. Retain customer's SIMMs.

Video display exhibits "ghosting," or system boots and then loses video

- Check for Apple-labeled SIMMs manufactured by NEC. Replace any NEC SIMMs that have a date code of 9052 or below.

Disk Drive Problems

Solutions

Internal disk drive runs continuously

1. Replace bad disk.
2. Replace internal disk drive cable.
3. Replace internal disk drive.
4. Replace logic board. Retain customer's SIMMs.

Audio and video are present, but one internal drive does not operate

1. Replace bad disk.
2. Verify that all external SCSI devices are disconnected.
3. Replace internal disk drive cable.
4. Replace internal disk drive.
5. Replace logic board. Retain customer's SIMMs.
6. Replace power supply.

Audio and video are present, but neither internal drive operates

1. Replace bad disk.
2. Verify that all external SCSI devices are disconnected.
3. Replace power supply.
4. Replace logic board. Retain customer's SIMMs.

Disk ejects; icon with blinking "X" displays

1. Replace disk with known-good system disk.
2. Replace internal disk drive cable.
3. Replace internal disk drive.
4. Replace logic board. Retain customer's SIMMs.

Will not eject disk

1. Switch power off and hold mouse button down while switching power back on.
2. Eject disk manually by pushing opened paper clip into hole beside drive slot.
3. Replace internal disk drive.

MS-DOS drive does not recognize disk formatted on 1.4 MB FDHD SuperDrive

- Reformat disk using MS-DOS™ drive.



- | | |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Attempts to eject disk but doesn't | <ol style="list-style-type: none"> 1. Reinsert disk. 2. Reseat top cover so drive slots line up correctly. 3. Try ejecting disk manually by pushing opened paper clip into hole beside drive slot. 4. Replace internal disk drive. |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

SCSI Drive Problems Solutions

- | | |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internal hard disk will not operate, LED does not light, drive does not spin | <ol style="list-style-type: none"> 1. Replace SCSI signal cable. 2. Replace SCSI power cable. 3. Replace hard disk. 4. Replace logic board. Retain customer's SIMMs. |
| Drive does not appear on desktop | <ul style="list-style-type: none"> — If Macintosh IIcx, there may be a SCSI termination problem. Refer to Macintosh IIcx—SCSI Termination to verify that computer is properly terminated. |
| Works with internal or external SCSI device but will not work with both | <ol style="list-style-type: none"> 1. Check SCSI device switch setting on external device. Make sure setting isn't 0 (internal hard drive address) or 7 (CPU address). 2. If Macintosh IIcx, there may be a SCSI termination problem. Refer to Macintosh IIcx—SCSI Termination to verify that computer is properly terminated. 3. Replace SCSI terminator on external device. 4. Verify that terminator is installed on internal SCSI drive. 5. Refer to <i>SCSI Hard Disk Drive Technical Procedures</i> for troubleshooting external drive. |

Peripheral Problems Solutions

- | | |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No response to any key on keyboard | <ol style="list-style-type: none"> 1. Check keyboard connection to ADB port. 2. Replace keyboard cable. 3. Replace keyboard. 4. Replace logic board. Retain customer's SIMMs. |
| Cursor does not move | <ol style="list-style-type: none"> 1. Check mouse connection. 2. Clean mouse, if necessary. 3. If mouse was connected to keyboard, connect it to rear ADB port. If mouse works, replace keyboard. 4. If mouse does not work in any ADB port, replace mouse. 5. Replace logic board. Retain customer's SIMMs. |
| Cursor moves, but clicking mouse button has no effect | <ol style="list-style-type: none"> 1. Replace mouse. 2. Replace logic board. Retain customer's SIMMs. |
| Cannot double-click to open application, disk, or server | <ol style="list-style-type: none"> 1. Remove any multiple system files on hard disk. 2. Clear parameter RAM. Hold down <Shift> <Option> <Command> keys and select Control Panel from Apple pull-down menu. Reset mouse controls. |

continued...



Macintosh II, IIx, and IIfx

Symptom/Cure Chart

Peripheral Problems (continued)

Solutions

Cannot double-click to open application, disk, or server

3. If mouse was connected to keyboard, connect it to rear ADB port. If mouse works, replace keyboard.
4. If mouse does not work in any ADB port, replace mouse.
5. Replace logic board. Retain customer's SIMMs.

Known-good ImageWriter or ImageWriter II will not print

1. Make sure correct version of system software is being used.
2. Make sure that Chooser and Control Panel are set correctly.
3. Replace printer interface cable.
4. Replace logic board. Retain customer's SIMMs.

Known-good LaserWriter will not print

1. Make sure correct version of system software is being used.
2. Make sure that Chooser and Control Panel are set correctly.
3. Refer to *Networks* tab in *Apple Service Technical Procedures*.

Miscellaneous Problems

Solutions

No sound from speaker

1. Verify that volume setting in Control Panel is set to 1 or above.
2. Replace speaker.
3. Replace logic board. Retain customer's SIMMs.

HMMU socket does not allow PMMU installation

- Replace logic board. Verify that socket is 13 x 13 grid array package and that it contains 132 gold contacts inside socket. (Sockets containing 70 pins do not support PMMU.)

System hangs when first application is launched, or displays error code and locks up (Macintosh IIx only)

- Check for Apple-labeled SIMMs manufactured by NEC. Replace any NEC SIMMs that have a date code of 9052 or lower.

Macintosh II, IIfx, and IIfx

Specifications



Macintosh II Specifications

| | |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68020, 32-bit internal architecture 15.6672 MHz clock speed |
| Coprocessor | MC68881 floating-point unit (FPU) |
| Memory | 1 MB, expandable to 8 MB (120 ns or faster SIMMs) 256K ROM standard Optional 68851 paged memory management unit (PMMU) |
| Monitors | Apple High-Resolution Monochrome AppleColor™ High-Resolution RGB Apple Macintosh Portrait Display Apple Two-Page Monochrome |
| Interfaces | Two RS-232/RS-422 serial ports SCSI interface (50-pin internal connector and DB-25 external connector) Two Apple Desktop Bus (ADB) ports Six NuBus™ internal slots supporting full 32-bit address and data buses One stereo sound port |
| Internal Storage | Built-in 3.5-inch, 800K disk drive Optional second 3.5-inch, 800K disk drive 1.4 MB, Apple FDHD SuperDrive upgrade Optional internal Hard Disk 20SC, 40SC, 80SC, 160SC |
| Sound | Apple custom digital sound chip (ASC), including four-voice wavetable synthesis, stereo sampling generator |
| Electrical | Line voltage: 90 to 140 volts; 170 to 270 volts, automatically configured Frequency: 48 to 62 Hz Maximum power: 220 watts, not including monitor power |



Macintosh II, IIx, and IIx

Specifications

| Macintosh IIx Specifications | |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68030, 32-bit internal architecture 15.6672 MHz clock speed 256-byte instruction and data caches Built-in paged memory management unit (PMMU) |
| Coprocessor | MC68882 floating-point unit (FPU) 15.6672 MHz clock speed |
| Memory | 1 MB, expandable to 8 MB (100 ns or faster SIMMs) 256K ROM standard |
| Monitors | Apple High-Resolution Monochrome AppleColor High-Resolution RGB Apple Macintosh Portrait Display Apple Two-Page Monochrome |
| Interfaces | Two RS-232/RS-422 serial ports SCSI interface (50-pin internal connector and DB-25 external connector) Two Apple Desktop Bus (ADB) ports Six NuBus internal slots supporting full 32-bit address and data buses One stereo sound port |
| Internal Storage | Built-in 1.4 MB FDHD SuperDrive Optional second FDHD SuperDrive Optional internal Hard Disk 40SC, 80SC, 160SC |
| Sound | Apple custom digital sound chip (ASC) provides 8-bit stereo sampling at 44.1 KHz and includes four-voice wavetable synthesis |
| Electrical | Line voltage: 100-240 VAC, automatically configured Frequency: 48 to 62 Hz Max power: 220 watts, not including monitor power |



Macintosh IIfx Specifications

| | |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68030, 32-bit internal architecture 40 MHz clock speed Built-in paged memory management unit (PMMU) Two 256-byte instruction and data caches |
| Coprocessor | MC68882 floating-point unit (FPU) 40 MHz clock speed |
| Static RAM Cache | Built-in zero-wait-state 32K static RAM cache memory architecture |
| Memory | 4 MB of RAM, expandable to 8 MB 80 ns, fast-page mode, 64-pin SIMMs |
| Parity Support | Installation of optional parity-generating chip and parity DRAM (9-chip, 60 ns SIMM) provides parity error detection |
| Memory Subsystem | Supports overlapping reads from cache/ROM and writes to DRAM |
| Input/Output Processor Chips | SWIM chip manages the floppy disk drive(s) SCC chip manages the Apple Desktop Bus and serial ports |
| SCSI/DMA Controller | Standard cell implementation of 53C80 SCSI chip and DMA control logic (the SCSI/DMA chip manages the SCSI bus) |
| Interfaces | Two RS-232/RS-422 serial ports SCSI interface with direct memory access for faster transfers and compatibility with faster peripherals Processor-direct slot (PDS) provides high-speed, 32-bit access to the system bus Six NuBus internal slots supporting full 32-bit address and data buses Two Apple Desktop Bus (ADB) ports Stereo sound jack |
| Internal Storage | Two 1.4 MB FDHD SuperDrives Internal Hard Disk 40SC, 80SC, 160SC |
| Sound | Apple custom digital sound chip (ASC) |
| Electrical | Line voltage: 100 to 240 VAC Frequency: 48 to 62 Hz Maximum power: 230 watts, not including monitor power |



Macintosh II, IIx, and IIx_e

Memory Upgrades

Macintosh II and IIx Memory Upgrades

The Macintosh II and IIx require 120 ns (or faster) SIMMs. The 150-ns SIMMs will cause serious timing problems. All SIMMs in each bank must be the same size. Mitsubishi 1 MB SIMMs for the Macintosh IIx, which are labeled "For 030 Systems Only," should be used only in systems with 68030 microprocessors.

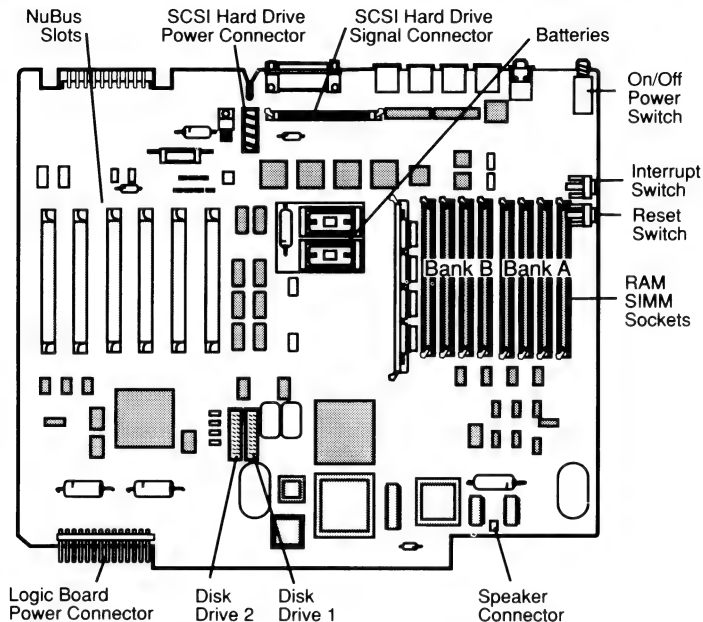


Figure: Macintosh II and IIx Logic Board

| Size | Bank A | Bank B |
|------|--------------|--------------|
| 1 MB | 4—256K SIMMs | Empty |
| 2 MB | 4—256K SIMMs | 4—256K SIMMs |
| 4 MB | 4—1 MB SIMMs | Empty |
| 5 MB | 4—1 MB SIMMs | 4—256K SIMMs |
| 8 MB | 4—1 MB SIMMs | 4—1 MB SIMMs |

Macintosh II, IIx, and IIfx

IIfx Memory Upgrade & II PMMU Upgrade



Macintosh IIfx Memory Upgrade

The Macintosh IIfx requires 80 ns (or faster) SIMMs in systems without the parity checking option, 60 ns (or faster) SIMMs in systems with parity checking. LaserWriter II SIMMs cannot be used in the Macintosh IIfx.

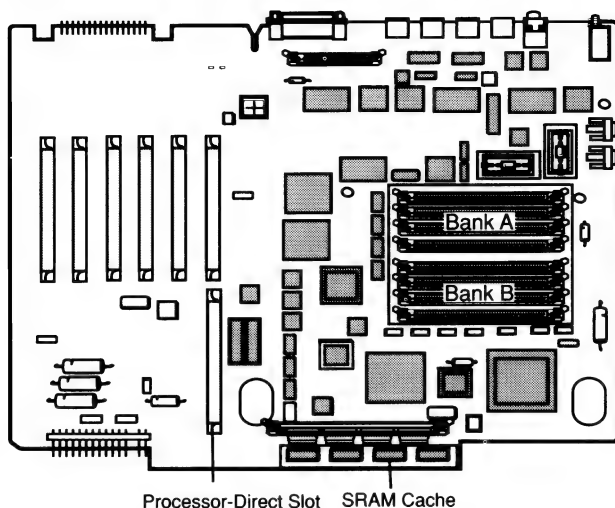


Figure: Macintosh IIfx Logic Board

| Size | Bank A | Bank B |
|------|----------------|----------------|
| 4 MB | 4 — 1 MB SIMMs | Empty |
| 8 MB | 4 — 1 MB SIMMs | 4 — 1 MB SIMMs |

Macintosh II PMMU Upgrade Procedure

1. Remove the Macintosh II top cover and drive mount.
2. Locate the HMMU chip on the logic board (**see Figure on the next page**).
3. Using a small flat-blade screwdriver, gently pry up the sides of the chip to remove the HMMU from the socket.
4. Position the PMMU so that the line on its surface is pointing toward the speaker at the lower-right corner of the logic board.
5. Line up the pins in the socket and gently press the PMMU into the socket.
6. Replace the Macintosh II drive mount and top cover.



Macintosh II, IIx, and IIcx

Macintosh II FDHD SuperDrive Upgrade

The system software must be version 6.0.2 or higher to use the 1.4 MB FDHD SuperDrive. If the software is lower than 6.0, the drive will be recognized as an 800K mechanism.

Upgrade Procedure

1. Place the Macintosh II on the grounded workbench pad and put on your grounding wriststrap.
2. Remove the top cover, video card (and any other cards installed), and the drive mount.
3. Using an IC extractor, remove the four ROMs at the logic board locations **shown in the Figure below**.
4. Using the following chart and the figure below, install the four revised 512K ROMs. The notch at the end of each ROM should face the front of the logic board.

| <u>ROM</u> | <u>P/N</u> |
|------------|------------|
| HI | 661-0639 |
| MED HI | 661-0640 |
| MED LO | 661-0641 |
| LO | 661-0642 |

5. Using the IWM/SWIM extractor (**see Special Tools Index in the General Information section**), remove the IWM chip from the logic board (**see Figure**).
6. Position the SWIM chip on the logic board socket (**see Figure**) so that the beveled edge of the chip (the edge with the dot) is facing the white dot on the logic board.
7. Line up the pins in the socket and gently press straight down on the SWIM chip until it is seated in the socket.
8. Install the 1.4 MB FDHD SuperDrive onto the drive mount on drive 1 or drive 2.
9. Replace the drive mount, the video card (and any other cards that you removed), and the top cover.
10. Place the 1.4 MB and 800K labels in the appropriate positions on the front of the Macintosh II.

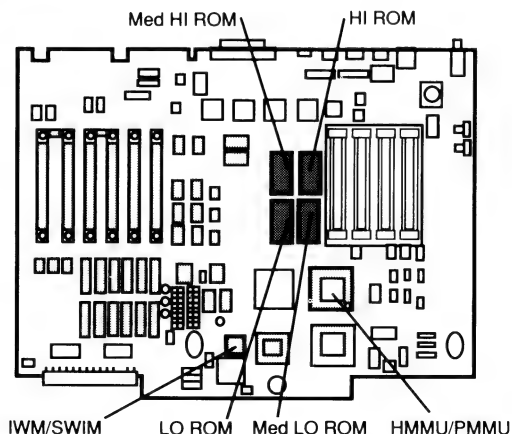


Figure: Macintosh II Logic Board

Macintosh II, IIx, and IIcx

Macintosh IIcx—SCSI Termination



The Macintosh IIcx is able to transfer data to and from SCSI devices much faster than earlier Macintosh computers. This increased data transfer rate has made it necessary to modify the termination characteristics of the SCSI interface. Three new parts are used to implement these SCSI termination changes:

- Apple SCSI Cable Terminator II
- Internal SCSI Termination Block
- Internal SCSI Filter

Apple SCSI Cable Terminator II

SCSI Cable Terminator II must be installed to provide proper termination when one or more external SCSI devices is attached to a Macintosh IIcx. Rules for using and installing Terminator II are the same as those for the original SCSI terminator. To help you tell these devices apart, the plastic on the Terminator II is black, whereas the plastic on the original terminator is blue.



CAUTION: Never connect more than one Cable Terminator II on a SCSI daisy chain. Connecting more than one terminator can damage the Macintosh IIcx.

Internal SCSI Termination Block

The termination block must be installed to provide internal SCSI termination for systems **without** an internal SCSI hard drive. Apple installs this termination block (and the internal SCSI filter) at the logic board SCSI connector on all Macintosh IIcx systems shipped without internal SCSI drives (**see Figure**). The termination block must be removed when an internal SCSI drive is added to the system.

Internal SCSI Filter

The SCSI filter must be installed to provide the proper termination capacitance for third-party drives and for Apple internal drives shipped before 3/19/90. When a SCSI drive is added to a Macintosh IIcx that has no SCSI drives installed, **the SCSI filter must be removed from the Macintosh IIcx logic board and connected to the drive.**

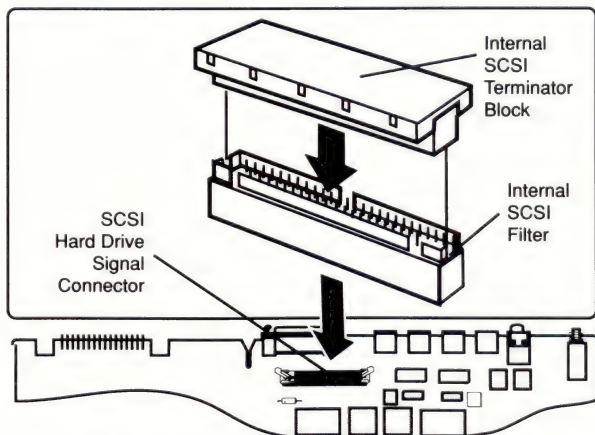


Figure: Macintosh IIcx Without Internal SCSI Drive



Macintosh II, IIx, and IIcx

Defective Macintosh IIcx SIMMs

Some Macintosh IIcx systems and 4 MB expansion memory kits were manufactured with defective DRAM chips from NEC. Systems using these defective NEC SIMMs can experience a variety of failures, including:

- System does not boot
- System hangs on first application launch
- System boots but loses video (memory related)
- System sounds error chords
- Video display exhibits "ghosting"
- System displays an ID error and locks up

Macintosh IIcx systems with NEC SIMMs that have date code 9052 or lower can exhibit these failures and should be replaced. Locate the date code as shown below (see Figure).

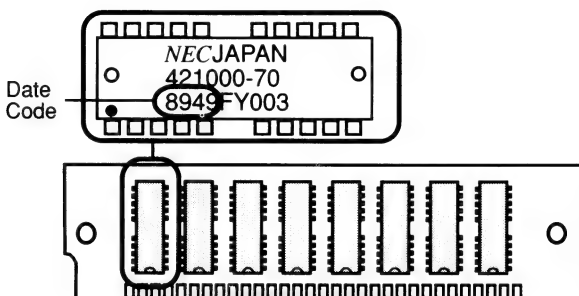
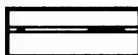


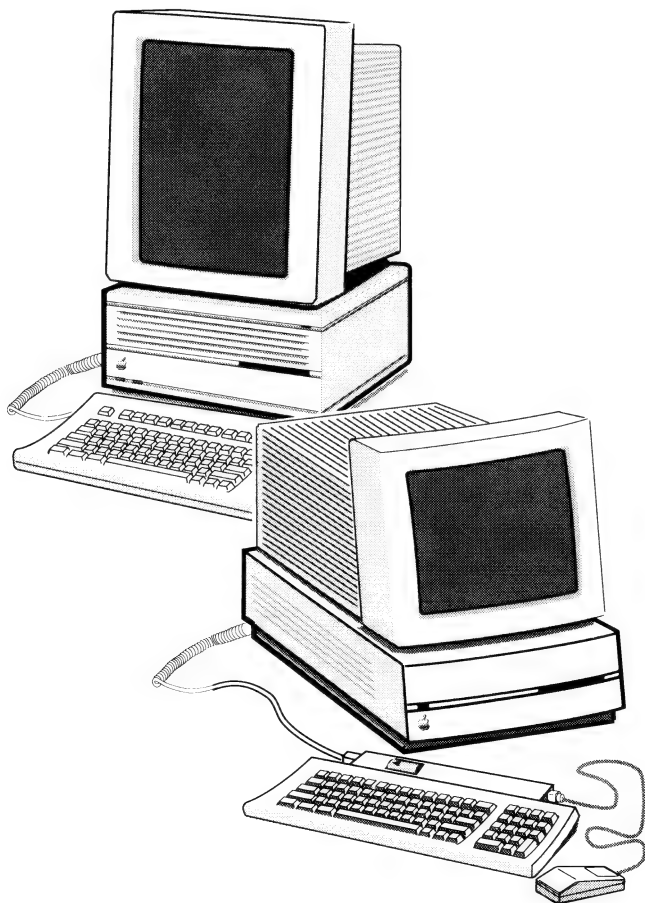
Figure: Location of Date Code on NEC SIMMs



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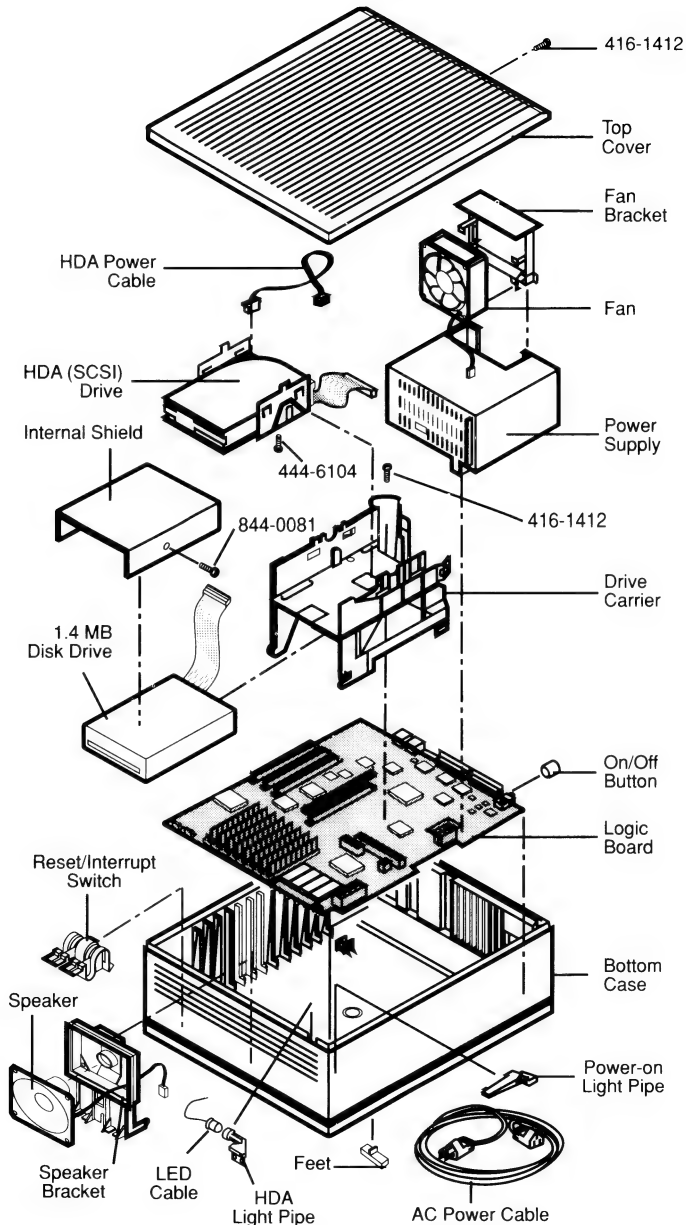
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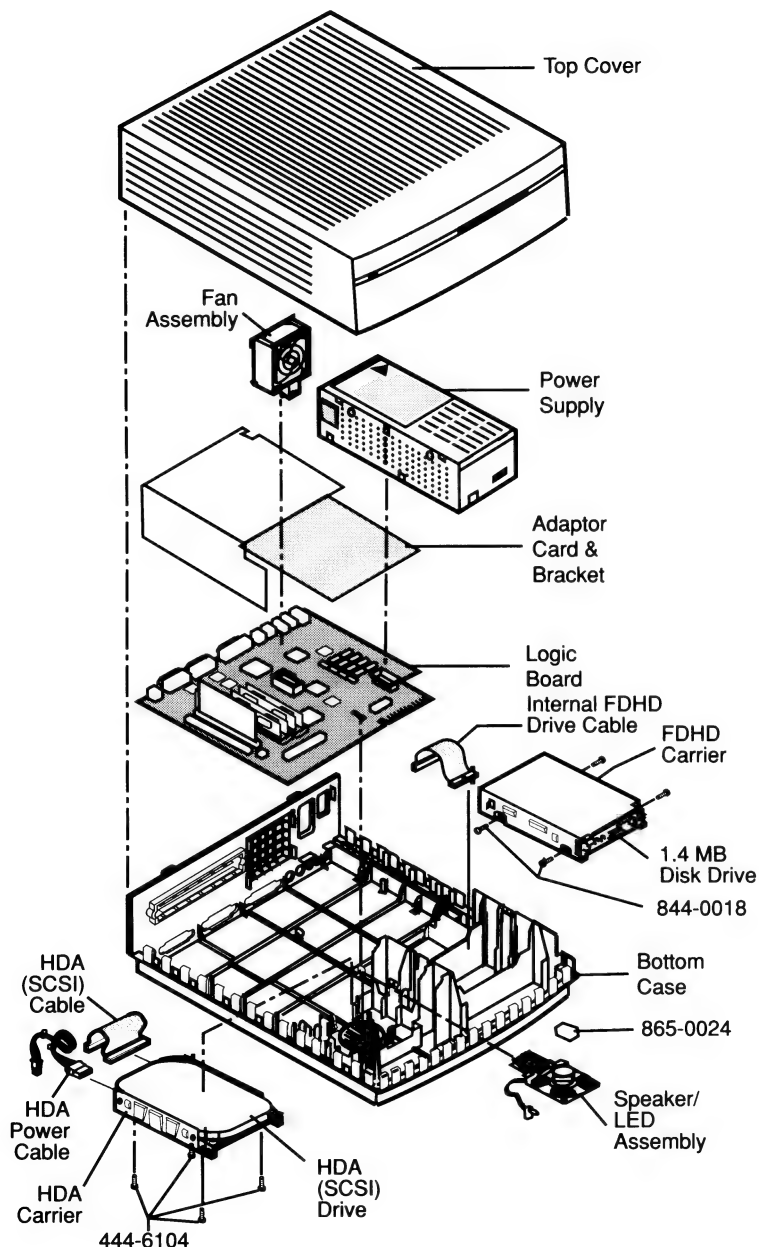
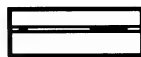
Macintosh Ilcx, Ilci, & Ilsi

Exploded View—Macintosh Ilcx & Ilci



Macintosh IIcx, IIci, & IIsi

Exploded View—Macintosh IIsi





Macintosh IIcx, IIci, & IIsi

Parts List

Macintosh IIcx & IIci

Bottom Case parts

| | |
|-----------------------------------------------------------------------------|----------|
| Cable, HDA LED (amber) | 590-0506 |
| Light Pipe, Power-On | 815-6032 |
| Light Pipe, HDA | 815-6036 |
| Rubber Feet | 865-0026 |
| Cable, AC Power (smoke) (& Mac IIsi) | 590-0380 |
| Disk Drive, Apple 3.5, 1.4 MB FDHD/SuperDrive | 661-0474 |
| Cable, Internal FDHD | 590-0607 |
| Internal Shield | 805-0961 |
| Screw, FDHD Shield/Carrier to FDHD | 844-0018 |
| Drive Carrier | 815-6030 |
| HDA, 20 MB, Internal 3.5 SCSI | 661-0373 |
| HDA, 40 MB, Internal 3.5 SCSI | 661-0464 |
| HDA, 80 MB, Internal 3.5 SCSI | 661-0600 |
| HDA, 80 MB, Int. 3.5 SCSI with A/UX, v.1.1 (replaced by 661-0613) | 661-0561 |
| HDA, 80 MB, Internal 3.5 SCSI with A/UX, v.2.0 | 661-0613 |
| Cable, HDA Power (Mac IIcx) | 590-0505 |
| Cable, HDA Power (2 x 2 Pin) | 590-0512 |
| Cable, Internal HDA (SCSI Connector Cable) | 590-0609 |
| HDA Mounting Bracket | 805-5078 |
| Screw, 6-32 x .250 (HDA to HDA Bracket) | 444-6104 |
| Keyboard, Regular Apple* (& Mac IIsi) | 661-0383 |
| Lithium Battery | 742-0011 |
| Battery Holder Cover | 520-0344 |
| Mouse, ADB* (& Mac IIsi) | 661-0479 |
| On-Off Button | 815-6033 |
| Power Supply with Fan | 661-0467 |
| Bracket, Power Supply Fan | 815-5071 |
| Power Supply Fan | 982-0023 |
| Reset/Interrupt Switch | 815-6034 |
| Speaker | 630-5503 |
| Speaker Bracket | 815-6031 |
| Top Cover | 810-6028 |
| Screw, M 3.5 x .6 x 8 (Top Cover; HDA Bracket/Bottom Case) | 416-1412 |

Macintosh IIcx

| | |
|----------------------------------------------------|----------|
| Bottom Case | 630-5502 |
| Logic Board (w/o RAM; replaces 661-0459) | 661-0537 |
| SIMM, 256K, 120 ns | 661-0402 |
| SIMM, DIP, 256K, 120 ns | 661-0494 |
| SIMM, 1 MB, 120 ns | 661-0403 |
| SIMM, DIP, 1 MB, 120 ns | 661-0410 |

Macintosh IIci

| | |
|---------------------------------|----------|
| Bottom Case | 630-5662 |
| Logic Board (w/o RAM) | 661-0532 |
| SIMM, 256K x 4, 80 ns | 661-0519 |
| SIMM, 1 MB, 80 ns | 661-0520 |

Macintosh Ilcx, Ilci, & Ilsi

Parts List & Symptom/Cure Chart



| | |
|-------------------------------------|----------|
| Logic Board, Parity | 661-0583 |
| SIMM, 1 MB x 9, 80 ns, Parity | 661-0546 |

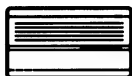
Macintosh Ilsi

| | |
|-----------------------------------------------------|----------|
| Bottom Case | 810-6032 |
| Platinum Foot | 865-0024 |
| Disk Drive, Apple 3.5, 1.4 MB FDHD/SuperDrive | 661-0474 |
| Cable, Internal FDHD Drive | 591-0025 |
| FDHD Carrier/Shield | 805-0961 |
| Screw, FDHD Shield/Carrier to FDHD | 844-0018 |
| Fan Assembly | 810-6030 |
| HDA, 40 MB, 1", Internal 3.5 SCSI | 661-0614 |
| HDA, 80 MB, 1", Internal 3.5 SCSI | 661-0624 |
| Cable, Internal HDA (SCSI Connector Cable) | 591-0026 |
| Cable, HDA Power | 591-0027 |
| HDA Carrier | 805-0980 |
| Screw, 6-32 x .250 (HDA to HDA Bracket) | 444-6104 |
| Logic Board | 661-1615 |
| Bracket, plastic, 030 Adaptor Card | 815-6246 |
| Lithium Battery | 742-0011 |
| NuBus Adaptor Card | 661-0645 |
| 030 Adaptor Card | 661-0644 |
| SIMM, SOJ, 256K, 80 ns | 661-0519 |
| SIMM, SOJ, 1 MB, 80 ns | 661-0520 |
| SIMM, SOJ, 1 MB, 80 ns, Parity | 661-0546 |
| Thumbscrew, NuBus Adaptor Card | 450-0032 |
| Microphone Assembly | 699-5071 |
| Power Supply | 661-1616 |
| Speaker/LED Assembly | 810-6031 |
| Top Cover | 810-6034 |
| Light Pipe, Power-On | 815-6247 |

Note: For ADB input devices and part numbers, see *General Information*.

Symptom/Cure Chart

| System Problems | Solutions |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Does not power on—screen is black, fan is not running, and LED is not lit | <ol style="list-style-type: none"> 1. Check cables. 2. Plug monitor directly into wall socket, and verify that monitor has power. 3. Replace power cord. 4. Check batteries. Voltage should be above 2.8. 5. Replace power supply. 6. Replace logic board. Retain customer's SIMMs. |
| System intermittently crashes or locks up | <ol style="list-style-type: none"> 1. Make sure system software is correct version. 2. Make sure software is known-good. 3. Replace logic board. Retain customer's SIMMs. 4. Replace SIMMs. 5. Replace power supply. 6. If system has Macintosh Ilci Cache Card with a serial number beginning with "CF," remove and return card to Apple. See <i>Apple Service Programs</i>. |



Macintosh IIcx, IIci, & IIsi

Symptom/Cure Chart

System Problems (continued)

Solutions

Clicking, chirping, or thumping sound

1. Replace power supply.
2. Disconnect hard disk. Replace if noise disappears.
3. Replace logic board. Retain customer's SIMMs.

System shuts down intermittently

1. Make sure air vents on back side and top of main unit are not obstructed. Thermal protection circuitry may shut down system. After 30 to 40 minutes, system should be OK.
2. Replace power cable.
3. Replace power supply.
4. Replace logic board. Retain customer's SIMMs.

System intermittently does not power on

1. Check cables.
2. Plug monitor directly to wall socket and verify that monitor has power.
3. Try known-good keyboard and ADB cable.
4. Replace power cord.
5. Check batteries. Should be above 2.8 volts.
6. Unplug power cord from system for 5-10 minutes. Replace power cord and switch on system. If system starts normally, replace power supply.
7. Replace logic board. Retain customer's SIMMs.

System seems to boot, then message "Finder is old version" displays

1. Clear parameter RAM. Hold down <Command> <Option> <P> <R> keys and reboot system. You will hear normal startup chords and about two seconds later you will hear another chord. This means parameter RAM has been cleared.
2. Replace logic board. Retain customer's SIMMs.

System restarts itself (Mac IIsi)

- Set the locking power switch on the rear of the computer to the unlocked (horizontal) position.

Video Problems

Solutions

Screen is dark, no audio, but fan is running and LED is lit

1. Replace video cable.
2. Replace monitor.
3. Move video card (if installed) to a different slot.
4. Replace video card (if installed).
5. Remove NuBus cards (if installed).
6. Remove external peripheral (if installed).
7. Replace RAM SIMMs.
8. If computer is a Mac IIsi with a ROM SIMM, replace ROM SIMM.
9. Replace logic board.
10. Replace power supply.

**Video Problems
(continued)****Solutions**

Screen is dark,
audio and drive
operate, fan is
running, and LED
is lit

1. Adjust brightness on monitor.
2. Replace monitor.
3. Replace video cable.
4. Move video card (if installed) to a different slot.
5. Replace video card (if installed).
6. Replace RAM SIMMs.
7. If computer is a Mac Ilsi with a ROM SIMM, replace ROM SIMM.
8. Replace logic board.
9. Replace power supply.

Partial or whole
screen is bright and
audio is present, but
no video information
is visible

1. Replace video cable.
2. Replace monitor.
3. Move video card (if installed) to a different slot.
4. Replace video card (if installed).
5. Make sure ROM jumper is on logic board.
6. Replace logic board. Retain customer's SIMMs.

Screen is completely
dark, fan is not
running, and LED
is not lit

1. Plug monitor directly into wall socket and verify that monitor has power.
2. Remove any installed NuBus cards.
3. Remove any external peripherals.
4. Replace power supply.
5. Replace logic board. Retain customer's SIMMs.

Black and white
video only

- Change monitor CDEV in Control Panel for additional shades of gray.

Note: Systems with 1 MB of memory default to black-and-white video. You can allocate additional memory to video on 1 MB systems, but this leaves little free RAM for other applications.

SCSI Problems**Solutions**

Internal hard disk will
not operate

1. Replace SCSI cable connector.
2. Replace SCSI power connector.
3. Replace hard disk.
4. Replace logic board. Retain customer's SIMMs.

Works with internal
or external SCSI
device but will not
work with both

1. Check SCSI device switch setting on external device.
2. Replace terminator on external device.
3. Verify that terminator is installed on internal SCSI drive.
4. Replace SCSI device select cable.



Macintosh IIcx, IIci, & IIsi

Symptom/Cure Chart

Drive Problems

Audio and video are present, but internal drive does not operate

1. Replace bad disk.
2. Verify that all external SCSI devices are disconnected.
3. Replace internal disk drive cable.
4. Replace internal disk drive.
5. Replace logic board. Retain customer's SIMMs.
6. Replace power supply.

Disk ejects; display shows icon with blinking "X"

1. Replace disk with known-good system disk.
2. Replace internal disk drive cable.
3. Replace internal disk drive.
4. Replace logic board. Retain customer's SIMMs.

Will not eject disk

1. Switch power off and hold mouse button down while switching power back on.
2. Eject disk manually by pushing opened paper clip into hole beside the drive slot.
3. Replace disk drive.

System attempts to eject disk but cannot

1. Try pushing disk completely in.
2. Eject disk manually by pushing opened paper clip into hole beside the drive slot.
3. Replace disk drive.

Internal disk drive runs continuously

1. Replace bad disk.
2. Replace internal disk drive cable.
3. Replace internal disk drive.
4. Replace logic board. Retain customer's SIMMs.

Peripheral Problems

No response to any key on the keyboard

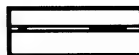
1. Check keyboard connection to ADB port.
2. Replace keyboard cable.
3. Replace keyboard.
4. Replace logic board. Retain customer's SIMMs.

Cursor does not move

1. Reboot system.
2. Check mouse connection.
3. If mouse was connected to a keyboard, connect it to a rear ADB port. If mouse works, replace keyboard.
4. If mouse does not work in any ADB port, replace mouse.
5. Replace logic board. Retain customer's SIMMs.

Cursor moves, but clicking the mouse button has no effect

1. Replace mouse.
2. Replace logic board. Retain customer's SIMMs.



Peripheral Problems (continued)

Solutions

Cannot double-click
to open an application,
disk, or server

1. Remove any multiple system files on hard disk.
2. Clear parameter RAM. Hold down <Shift>
<Option> <Command> keys and select Control
Panel from Apple menu. Reset mouse controls.
3. If mouse was connected to keyboard, connect it to
rear ADB port. If mouse works, replace keyboard.
4. If mouse does not work in any ADB port, replace
mouse.
5. Replace logic board. Retain customer's SIMMs.

Known-good
ImageWriter or
ImageWriter II
will not print

1. Make sure system software is correct version.
2. Make sure that Chooser and Control Panel are
set correctly.
3. Check DIP switch settings.
4. Replace printer interface cable.
5. Replace logic board. Retain customer's SIMMs.

Known-good
LaserWriter
will not print

1. Make sure system software is correct version.
2. Make sure that Chooser and Control Panel are
set correctly.
3. Refer to *Networks* tab in *Apple Service
Technical Procedures* for more information.

Miscellaneous Problems

Solutions

No sound from
speaker

1. Verify that volume setting in the Control Panel is
set to 1 or above.
2. Replace speaker.
3. Replace logic board. Retain customer's SIMMs.

Clock not running

1. Replace battery.
2. Replace logic board. Retain customer's SIMMs.

MacTest and
AppleCAT crash
on the Mac Ilci

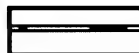
- Remove the Macintosh Ilci Cache Card and rerun
the diagnostic.



Macintosh IIcx, IIfx, & IIsi

Specifications

| Macintosh IIcx Specifications | |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68030, 32-bit internal architecture 15.6672 MHz clock speed Built-in paged memory management unit (PMMU) 256-byte instruction and data caches |
| Coprocessor | MC68882 floating-point unit (FPU) |
| Memory | 1 MB expandable to 8 MB (120 ns or faster SIMMs) 256K ROM standard |
| Monitors | Apple High-Resolution Monochrome AppleColor High-Resolution RGB Apple Macintosh Portrait Display Apple Two-Page Monochrome |
| Interfaces | Two RS-232/RS-422 serial ports SCSI interface (50-pin internal connector and DB-25 external connector) Two Apple Desktop Bus (ADB) ports Three NuBus internal slots supporting full 32-bit address and data buses Stereo sound port One DB-19 serial (disk drive) port |
| Internal Storage | Built-in 1.4 MB FDHD SuperDrive Optional internal Hard Disk 40SC, 80SC |
| Sound | Apple custom digital sound chip (ASC), including four-voice wavetable synthesis and stereo sampling generator |
| Electrical | Line voltage: 100 to 240 volts AC, automatically configured Frequency: 50 to 60 Hz Maximum power: 90 watts, not including monitor |

**Macintosh Ilci Specifications**

| | |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68030, 32-bit internal architecture 25 MHz clock speed Burst mode RAM access 256-byte instruction and data caches Built-in paged memory management unit (PMMU) |
| Coprocessor | MC68882 floating-point unit (FPU) 15.6672 MHz clock speed |
| Cache Connector | 120-pin memory cache connector (for connection of optional high-speed memory cache card) |
| Memory | 1 MB expandable to 8 MB (80 ns or faster SIMMs) 512K ROM standard |
| Parity Support | Purchase of optional parity board with parity generating chip and parity RAM converts the system to a parity system |
| Built-in Video Support | Apple High-Resolution Monochrome AppleColor High-Resolution RGB Apple Macintosh Portrait Display |
| Interfaces | Two RS-232/RS-422 serial ports SCSI interface (50-pin internal connector and DB-25 external connector) One DB-19 serial (disk drive) port Two Apple Desktop Bus (ADB) ports Three NuBus internal slots supporting full 32-bit address and data buses One DB-15 video port for built-in video Stereo sound port |
| Internal Storage | Built-in 1.4 MB FDHD SuperDrive Optional internal Hard Disk 40SC, 80SC |
| Sound | Apple custom digital sound chip (ASC), including four-voice wavetable synthesis and stereo sampling generator |
| Electrical | Line voltage: 100 to 240 volts AC, automatically configured Frequency: 50 to 60 Hz Maximum power: 90 watts, not including monitor |



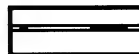
Macintosh IIcx, IIci, & IIsi

Specifications

| Macintosh IIsi Specifications | |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microprocessor | MC68030, 32-bit internal architecture 20 MHz clock speed Burst mode RAM access Two 256-byte instruction and data caches Built-in memory management unit (MMU) that supports the A/UX operating system |
| Coprocessor | Optional adapter card with 20 MHz MC68882 floating-point unit (FPU) |
| Expansion Connector | One expansion slot supporting NuBus (with adapter) or 030 Direct Slot expansion card |
| Memory | 2 or 5 MB expandable to 17 MB (100 ns or faster SIMMs) 512K ROM standard |
| Built-in Video Support | Apple High-Resolution Monochrome Monitor AppleColor High-Resolution RGB Monitor Apple Macintosh Portrait Display Macintosh 12-Inch RGB Display Macintosh 12-Inch Monochrome Display |
| Interfaces | Two RS-232/RS-422 serial ports SCSI interface (50-pin internal connector and DB-25 external connector) One Apple Desktop Bus (ADB) port One external disk drive port One DB-15 video port for built-in video Stereo sound-out port Sound input port |
| Internal Storage | Built-in 1.4 MB FDHD SuperDrive Internal Hard Disk 40SC Optional internal Hard Disk 80SC |
| Sound | Apple custom digital sound chip (ASC) Monaural 8-bit sound input supporting 3:1 or 6:1 compression Monophonic 8-bit sound generator Omnidirectional electret microphone |
| Electrical | Line voltage: 100 to 240 volts AC, automatically configured Frequency: 47 to 63 Hz Maximum power: 100 watts, not including monitor |

Macintosh Ilcx, Ilci, & Ilsi

Macintosh Ilcx Memory Upgrade



The Macintosh Ilcx requires 120 ns (or faster) SIMM modules. The 150 ns SIMMs will cause serious timing problems. All SIMMs in each bank must be the same size.

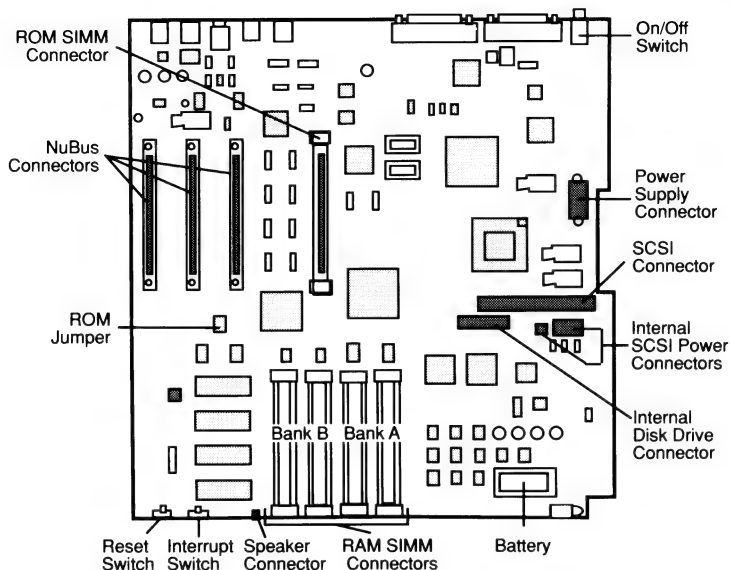


Figure: Macintosh Ilcx Logic Board

| Size | Bank A | Bank B |
|------|--------------|--------------|
| 1 MB | 4—256K SIMMs | Empty |
| 2 MB | 4—256K SIMMs | 4—256K SIMMs |
| 4 MB | 4—1 MB SIMMs | Empty |
| 5 MB | 4—1 MB SIMMs | 4—256K SIMMs |
| 8 MB | 4—1 MB SIMMs | 4—1 MB SIMMs |



Macintosh Ilcx, Ilci, & Ilsi

Macintosh Ilci Memory Upgrade

The Macintosh Ilci requires 80 ns fast page mode SIMM modules. The 100, 120, and 150 ns SIMMs will cause serious timing problems. All SIMMs in a bank must be the same size. SIMMs must be installed in Bank A if built-in video mode is used. To upgrade a parity system, the 80 ns, 1 MB x 9-bit parity SIMMs must be used or the parity function will be disabled.

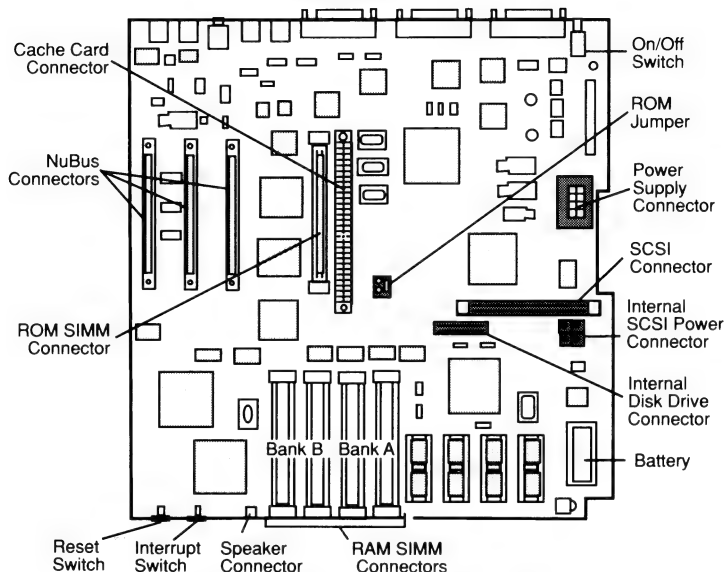
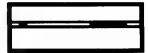


Figure: Macintosh Ilci Logic Board

| Size | Bank A | Bank B |
|-------------|------------------------------|------------------------------|
| 1 MB | 4—256K SIMMs Empty | Empty 4—256K SIMMs |
| 2 MB | 4—256K SIMMs | 4—256K SIMMs |
| 4 MB | 4—1 MB SIMMs Empty | Empty 4—1 MB SIMMs |
| 5 MB | 4—1 MB SIMMs 4—256K SIMMs | 4—256K SIMMs 4—1 MB SIMMs |
| 8 MB | 4—1 MB SIMMs | 4—1 MB SIMMs |
| 4 MB Parity | 4—1 MB parity SIMMs Empty | Empty 4—1 MB parity SIMMs |
| 8 MB Parity | 4—1 MB parity SIMMs | 4—1 MB parity SIMMs |

Macintosh Ilcx, Ilic, & Ilsi

Macintosh Ilsi Memory Upgrade



The Macintosh Ilsi requires 100 ns (or faster) SIMM modules. Slower SIMMs (e.g., 120 ns) will cause serious timing problems. All SIMMs must be the same size.

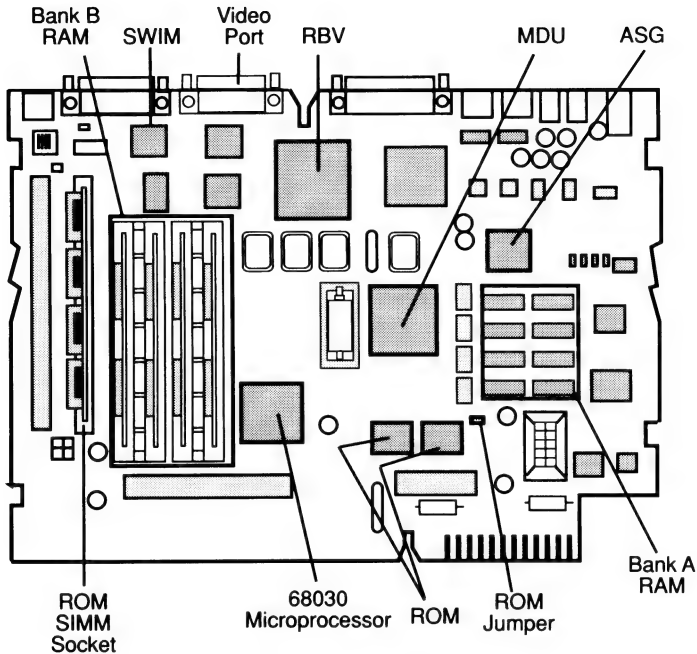


Figure: Macintosh Ilsi Logic Board

| Size | Bank A | Bank B |
|------|-------------------|--------------|
| 1 MB | 1 MB on-board RAM | Empty |
| 2 MB | 1 MB on-board RAM | 4—256K SIMMs |
| 5 MB | 1 MB on-board RAM | 4—1 MB SIMMs |

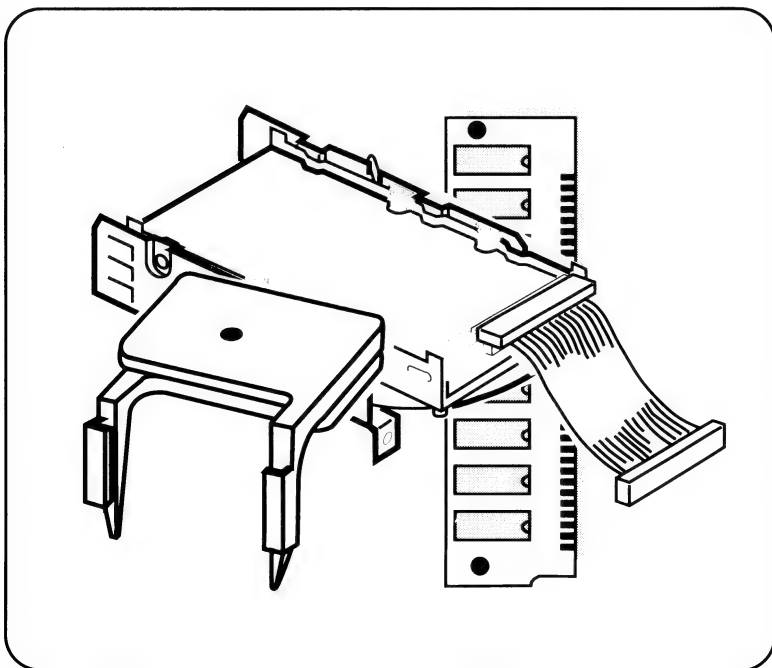


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Note: The General Information section contains repair procedures, compatibility and identification charts, diagnostics, and other information that apply to all of the Macintosh computers.





General Information

Disk Drives—Disk Ejection Problems

To avoid disk ejection problems:

- Avoid placing more than two labels on a disk. Make sure another disk is not already in the drive, and press disks gently into the drive.
- During installation, make sure the disk opening of the drive mechanism is centered in the bezel. If the disk opening is not centered, binding or friction may cause disk ejection problems.
- Inspect the internal mounting bracket before installation. A warped or bent mounting bracket will not align properly with the bezel and can cause disk ejection problems.



CAUTION: Pulling a disk forcefully from a drive may damage the drive mechanism.

Removing Disks That Will Not Eject

1. Push the disk back in and try to eject it electronically by:
 - a. Holding down the <Shift> and <Command> keys and pressing **1** (for an internal drive or drive 1) or **2** (for an external drive or drive 2).
 - b. Pulling down the File Menu and selecting **Eject**. (Repeat several times before giving up.)
2. If step 1 does not work, insert a straightened paper clip into the pin hole located to the right of the disk insertion slot.
3. If step 2 does not work, remove the disk drive and place the drive and RFI shield assembly upside down on a flat surface.
4. Remove the four screws that hold the drive mechanism to the RFI shield, and remove the drive mechanism.
5. Place the drive mechanism with the printed circuit board face down and the disk opening facing you. Press the eject lever at the right side of the disk drive (**see top figure below**).
6. With the left side of the drive mechanism facing you, locate the small arm with a cylindrical cog at its end (**see bottom figure below**). The cog will be caught in a half-moon depression.
7. Insert a small screwdriver as shown in the figure, and gently move the arm away from the disk until the disk pops forward slightly. Remove the disk from the disk drive.

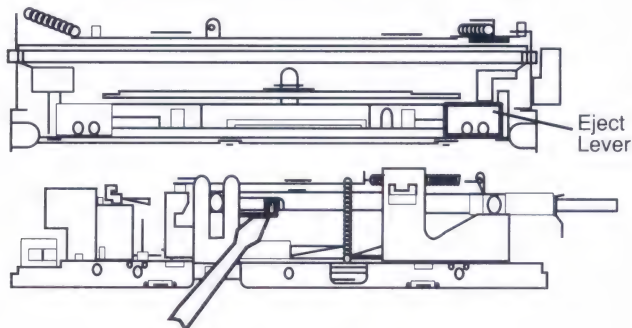


Figure: Removing Stuck Disk From Drive



Disk Drives—Internal Drive Cables

To identify the correct disk drive cable, refer to the part number stamped on the ribbon cable. Except for the red 400K drive cable (which does not have a stamped part number), do not rely upon cable color. Be sure to use only the cables listed in the compatibility table below.

Internal Disk Drive Cable Compatibility

| Macintosh Computers | 400K Drive 661-76156 | 800K Drive 661-0305 (MFD-51W or MFD- 51W-10) ¹ | 800K Drive 661-0345 (MFD-51W-03) | 1.4 MB FDHD SuperDrive 661-0474 |
|-------------------------------|----------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------|
| 512K ² | 590-0167 Red (short) | | | |
| 512K Enhanced ² | 590-0167 Red (short) | 590-0167 Red (short) | 590-0437 Yellow (short) | |
| Plus ² | | 590-0167 Red (short) | 590-0437 Yellow (short) | |
| SE ³ | | | 590-0437 (bottom drive) 590-0188 Red or Yellow (long cable; top) | 590-0437 (bottom) 590-0188 (top) |
| SE/30 | | | 590-0437 (bottom) 590-0188 (top) | 590-0437 (bottom) 590-0188 (top) |
| Classic | | | | 590-0167 |
| L C | | | | 590-0524 |
| II ³ /IIx/IIfx | | | 590-0188 | 590-0188 |
| IIcx/IIci | | | | 590-0607 |
| IIsi | | | | 591-0025 |
| Portable | | | | 590-0501 |

¹ Drive 661-0305 (obsolete) was replaced by drive 661-0345.

² When replacing or upgrading to an 800K drive in the Macintosh 512K, 512K enhanced, or Macintosh Plus, be sure to use disk drive cable 590-0437 (yellow).
The red drive cable (590-0167) used with 400K and obsolete 800K drives (661-0305) is not interchangeable with cable 590-0437.

³ Using an FDHD in the Macintosh SE and Macintosh II requires upgrading the logic board (refer to the FDHD upgrade procedures for those computers)



General Information

Disk Drives—Identification

The FDHD SuperDrive is a high-density (1.4 MB), 3.5-inch drive for 030 Macintosh systems, upgraded Macintosh SE and Macintosh II systems (**see FDHD Upgrade in those sections**), and the Macintosh Classic and LC. The FDHD SuperDrive is compatible with Apple's 400K and 800K data formats and provides data exchangeability between Apple systems (GCR data format) and MS-DOS or OS/2™ systems (MFM data formats).

Identifying an Internal Disk Drive

To identify an unlabeled internal drive, you can remove the computer cover and count the number of microswitches on the drive mechanism (**see Figure**). FDHD SuperDrives have three microswitches, 800K drives have two, and 400K drives one.

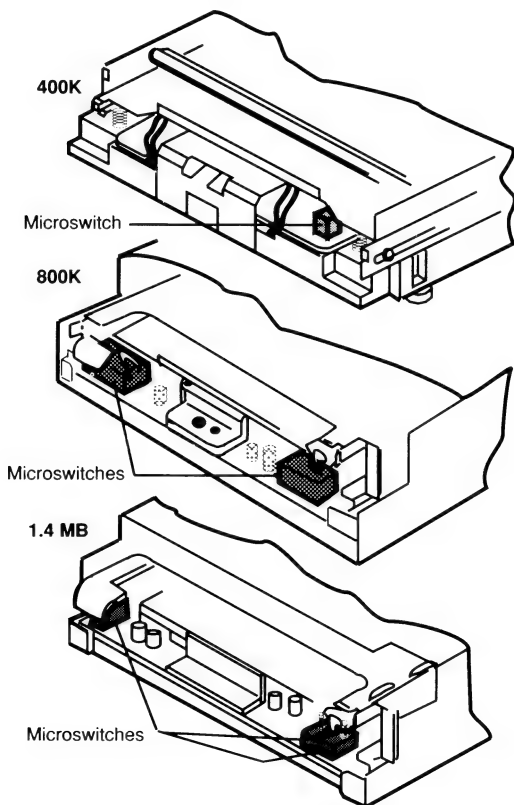


Figure: Macintosh Internal Disk Drives



High-Density Media

Special high-density, 3.5-inch disks are required to take full advantage of the increased storage capacity of the FDHD. These disks can be identified by the **HD** on the label, and by their two write-protect windows. Because HD disks are structurally different from other media, media/drive compatibility problems can occur. To avoid such problems, refer to the matrix below.



CAUTION: Apple does not recommend using high-density disks in 400K or 800K disk drives. Data saved to high-density disks using 400K or 800K drives is unreliable and could be lost.

Media and Drive Compatibility Matrix

| | | Media Formats | | | |
|-----------------------|------------|---------------|---------------|---------------|-----------------|
| | | 400K (GCR) | 800K (GCR) | 720K (MFM) | 1.4 MB (MFM) |
| Single-Sided Disks | 400K Drive | Yes | No | No | No |
| | 800K Drive | Yes | NR | No | No |
| | FDHD Drive | Yes | NR | No | No |
| Double-Sided Disks | 400K Drive | Yes | No | No | No |
| | 800K Drive | Yes | Yes | No | No |
| | FDHD Drive | Yes | Yes | Yes | No |
| High-Density Disks | 400K Drive | NR | No | No | No |
| | 800K Drive | NR | NR | No | No |
| | FDHD Drive | No | No | No | Yes |

Legend:

Yes—The selected disk and drive can read and write this media format.

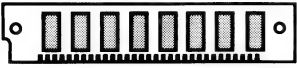
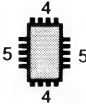
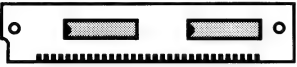
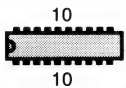
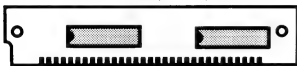
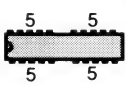
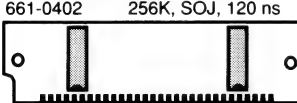
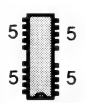
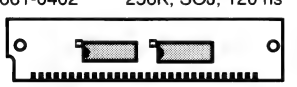
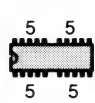
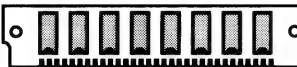


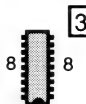
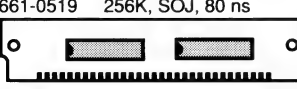
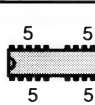
No—The selected disk cannot be used with the selected drive to read or write this media format.

NR—Apple does not recommend formatting the selected disk to this media format with the selected drive.



General Information

SIMM Identification—256K SIMMs

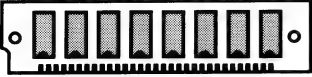

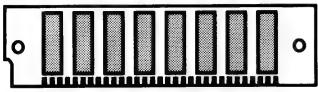

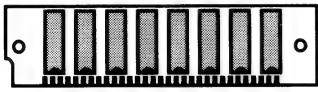

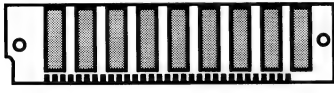

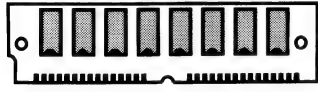

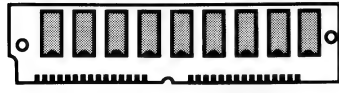

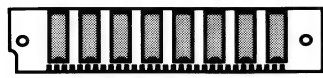

| Service Exchange Modules | Macintosh | | | | | | | | | |
|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------|----|-------|----|----|-----|------|------|------|
| | Plus | Classic | SE | SE/30 | LC | II | IIx | IIfx | IIxi | IIcx |
| 661-0402 256K, PLCC, 120 ns  |  | • | • | • | | • | • | | | • |
| 661-0402 256K, DIP, 120 ns  |  | • | • | • | | • | • | | | • |
| 661-0402 256K, SOJ, 120 ns  |  | • | • | • | | • | • | | | • |
| 661-0402 256K, SOJ, 120 ns  |  | • | • | • | | • | • | | | • |
| 661-0402 256K, SOJ, 120 ns  |  | • | • | • | | • | • | | | • |
| 661-0494 256K, DIP, 120 ns  |  | • | • | 1 2 | | • | • | | | • |
| 661-0402 256K, DIP, 120 ns  |  | • | 1 | | | | | | | |
| 661-0519 256K, SOJ, 80 ns  |  | • | • | • | | • | • | | • | • |

- 1 Can be installed in SIMM positions 3 and 4 only because of space constraints.
- 2 Can be installed in SIMM Bank A only because of space constraints.
- 3 Available from finished goods only—you will not receive this SIMM as a service exchange module. Apple ships a compatible service exchange module when receiving a finished-goods SIMM.

General Information

SIMM Identification—1 MB SIMMs



| Service Exchange Modules | Macintosh | | | | | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------|----|-------|----|----|-----|------|------|------|
| | Plus | Classic | SE | SE/30 | LC | II | IIx | IIfx | IIxi | IIcx |
| 661-0403 1 MB, SOJ, 120 ns   | • | • | • | • | | • | • | | • | |
| 661-0410 1 MB, DIP, 120 ns   | | | 1 | 2 | | • | • | | | • |
| 661-0520 1 MB, SOJ, 80 ns   | • | • | • | • | • | • | • | | • | • |
| 661-0546 1 MB, SOJ, 80 ns Parity   | • | • | • | • | • | • | • | | • | • |
| 661-0548 1 MB, SOJ, 80 ns, 64-Pin   | | | | | | | | • | | |
| 661-0549 1 MB, SOJ, 60 ns, Parity, 64-Pin   | | | | | | | | • | | |
| 661-0403 1 MB, SOJ, 120ns 3   | | | • | | | • | | | | • |



General Information

Diagnostics—MacTest

When used as stand-alone tests, the *MacTest* diagnostic programs perform pass/fail functional tests of the Macintosh computer systems. The procedures for using all *MacTest* programs are similar, but not identical. **Be sure to use the *MacTest* program for the system you want to test.** The information on the following pages summarizes how to hook up test equipment and run the *MacTest* programs. For more detailed information, see the *Apple Service Technical Procedures*.

Things to Remember

1. Use the Finder to make a backup copy of the *MacTest* disk. (If using a Macintosh or Macintosh Plus, use the appropriate disk copy program on the *MacTest* disk.) Do not write-protect your working disk.
2. Do not replace the System and Finder files on the *MacTest* disk.
3. Before running *MacTest*, close all Desk Accessories. Also note that most versions of *MacTest* are not compatible with MultiFinder™.
4. *MacTest* cannot test an internal SCSI hard drive or an external drive connected to a Hard Disk 20.
5. If you cannot boot the *MacTest* disk:
 - a. Check the power cable and internal cable connections.
 - b. Refer to the Symptom/Cure Chart, and replace the module(s) specified for your problem.
6. **(Macintosh / Macintosh Plus only)** If you receive an **error code** while attempting to run *MacTest*, refer to **Macintosh/Macintosh Plus MacTest Error Codes** (on the next page) to correct the problem.
7. **(Macintosh Portable only)** The power adapter must be connected to the Macintosh Portable for the *AppleCat/MacTest* diagnostic to operate.
8. If the desktop appears instead of the *MacTest* window, open the *MacTest* disk icon and highlight the *MacTest* file icon, select **Set Startup** from the Special menu, and reboot with the *MacTest* disk.
9. Loopbacks are not needed to run *MacTest*, but are necessary to thoroughly test the system. **Switch off the system when you connect a SCSI loopback card.**
10. If a logic board test is selected but the loopbacks are not installed, click **OK** in the dialog box that appears. Then deselect the logic board test, or **switch off power to the system** and install the loopback equipment.
11. Do not press the reset or interrupt switch while the RAM test is running. Pushing reset causes the RAM test to fail, and pressing interrupt could damage the *MacTest* disk.
12. After completing the repair, always run *MacTest* to verify that there are no other faults.



Running MacTest

1. **(Portable only)** Plug in the power adapter and connect it to the Portable.
2. Connect the following loopback equipment (**see Figures on next page**):
 - DB-9 serial port plugs (2) to serial ports (**Macintosh 128K/512K only**), or serial loopback cable (Mini DIN-8 cable) between serial ports.
 - SCSI loopback test card to SCSI port. (The Macintosh 128K/512K does not have SCSI circuitry, and the Portable does not require using the SCSI loopback test card.)
3. **(Portable only)** Reset the power manager by simultaneously depressing and then releasing the reset and interrupt switches.
4. Boot the *MacTest* disk.
5. Select tests from the Test Selections menu.
6. To loop on selected tests, select **Auto Run Selected** from the Options menu (**Macintosh/Macintosh Plus only**) or **Loop on selected tests** from the Test Selections window.
7. Click **Start**.

Macintosh / Macintosh Plus MacTest Error Codes

Before using this chart, verify that you are using a known-good *MacTest* disk. X's in the codes can represent any number.

| Error Code | Corrective Checks and Actions |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 100xx.xxxx | <ol style="list-style-type: none"> 1. Check that keyboard is connected. 2. Replace keyboard cable. 3. Replace keyboard. 4. Replace logic board. |
| 200xx.xxxx 300xx.xxxx | <ol style="list-style-type: none"> 1. Check that loopback connectors are installed. 2. Check that cables are connected. 3. Check that loopback connectors are good. 4. Replace logic board. |
| 400xx.xxxx | <ol style="list-style-type: none"> 1. Check that <i>MacTest</i> disk is unlocked. 2. Replace internal disk drive. |
| 500xx.xxxx | <ol style="list-style-type: none"> 1. Check that blank, formatted 400K disk is in external disk drive before running test. 2. Check that blank disk is unlocked. 3. Replace external disk drive. |
| 600xx.xxxx | Replace logic board. |
| 800xx.xxxx (Mac Plus only) | <ol style="list-style-type: none"> 1. Check that SCSI loopback test card is connected. 2. Check that cables are connected. 3. Check that SCSI loopback card is good. 4. Replace logic board. |



General Information

Diagnostics—MacTest Hookups

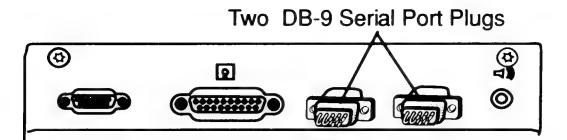


Figure: Macintosh 128K/512K MacTest Hookup

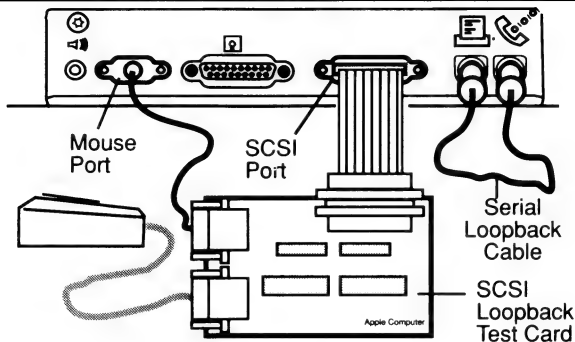


Figure: Macintosh Plus MacTest Hookup

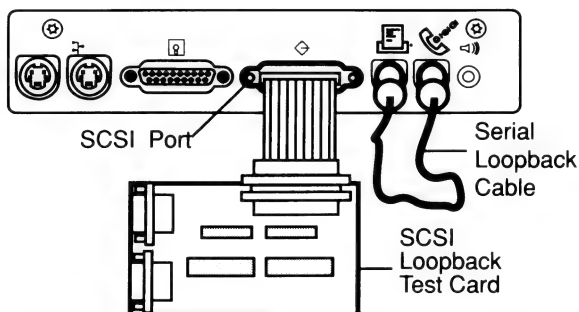


Figure: Macintosh SE & SE/30 MacTest Hookup

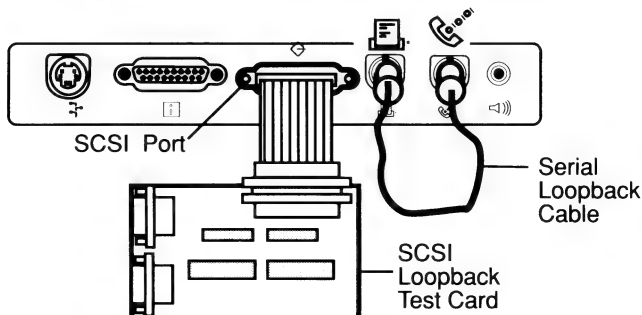


Figure: Macintosh Classic MacTest Hookup

General Information

Diagnostics—MacTest Hookups

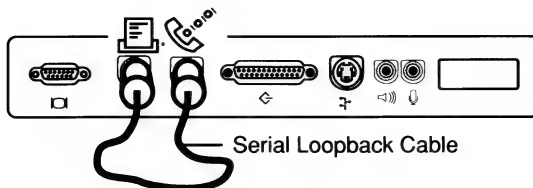


Figure: Macintosh LC MacTest Hookup

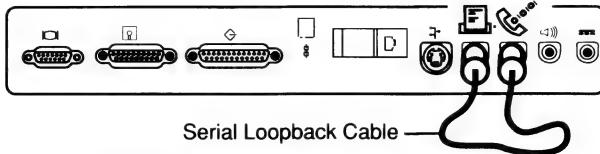


Figure: Macintosh Portable MacTest Hookup

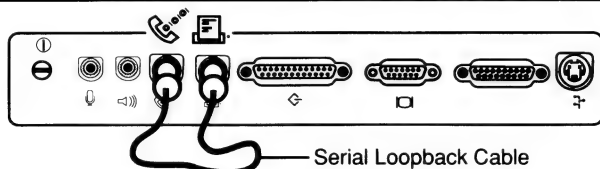


Figure: Macintosh IIsx MacTest Hookup

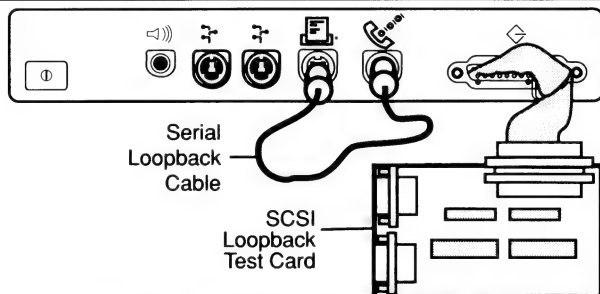


Figure: Macintosh IIx/IIcx MacTest Hookup

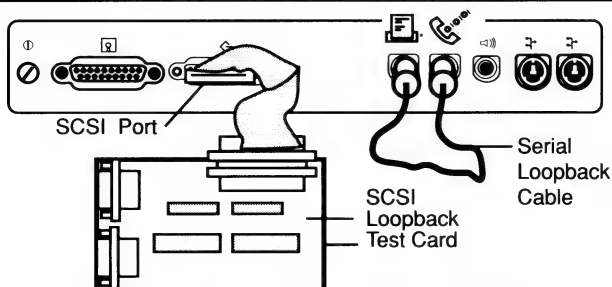


Figure: Macintosh IIfx/IIfcx MacTest Hookup



General Information

MacTest Diagnostics Matrix

| MacTest – Macintosh Hardware Diagnostic Matrix | | | | | | | | | |
|-------------------------------------------------------|---------------------------------------|------------------------------|--------------|----------------|--------------|-------------------|-------------------|----------------------|--------------|
| MacTest Products (across) (latest version beneath) | | Original MacTest (7.0) | S E (3.0) | SE/30 (1.0) | C L (1.0) | Portable (1.0) | II / IIX (3.1) | IIcx / IIci (2.0) | M P (1.1) |
| Computers | Mac 512K & 512K enhanced | • | | | | | | | |
| | Mac Plus | • | | | | | | | |
| | S E | | • | | | | | | |
| | SE/30 | | | • | | | | | |
| | Classic | | | | • | | | | |
| | Portable (nonbacklit) | | | | | • | | | |
| | Portable (backlit) | | | | | | | | |
| | L C | | | | | | | | • |
| | II / IIX | | | | | | • | | |
| | IIci | | | | | | | | • |
| | IIcx / IIci | | | | | | | • | |
| | IIx | | | | | | | | • |
| Monitors | Apple High-Res Monochrome | | | | | | • | • | • |
| | AppleColor High-Res RGB | | | | | | • | • | • |
| | Apple Two-Page Monochrome | | | | | | • | • | • |
| | Apple Macintosh Portrait Display | | | | | | • | • | • |
| | Portrait Display Series B | | | | | | • | • | • |
| | Mac 12-inch Monochrome Disp. | | | | | | • | • | • |
| | Mac 12-inch RGB Display | | | | | | | | • |
| Video Cards | Mac II Video Card | | | | | | • | • | • |
| | Mac II Two-Page Monochrome V.C. | | | | | | • | • | • |
| | Mac II Monochrome Video Card | | | | | | | • | • |
| | Mac II Portrait Video Card | | | | | | • | • | • |
| | Mac II High-Res Display V.C. | | | | | | | • | • |
| | Mac II Extended High-Res Display Card | | | | | | | • | • |
| | Mac Display Card 4-8 | | | | | | | | • |
| | Mac Display Card 8-24 | | | | | | | | • |
| | Mac Display Card 8-24GC | | | | | | | | • |

General Information

MacTest Diagnostics Matrix



| MacTest – Macintosh Hardware Diagnostic Matrix | | | | | | | | | |
|-------------------------------------------------------|--------------------------------------|----------------------------------------------------------|--------------|----------------|--------------|-------------------|-------------------|----------------------|--------------|
| MacTest Products (across) (latest version beneath) | | Original MacTest (7.0) | S E (3.0) | SE/30 (1.0) | C L (1.0) | Portable (1.0) | II / IIX (3.1) | IIcx / IIci (2.0) | M P (1.1) |
| Drives | Apple 3.5 (external) | | • | • | • | • | | • | LC IIci |
| | Apple PC 5.25 | | • | | | | • | | |
| | 400K (internal) | • | | | | | | | |
| | 800K (internal) | • | • | • | • | • | • | • | • |
| | FDHD/Super- Drive (Int/ext) | | • | • | • | • | • | • | • |
| | SCSI Hard Drives | | | | | | | | |
| | Apple HD20 (non-SCSI) | Use Macintosh Hard Disk Test 2.1 | | | | | | | |
| | Apple CD-ROM | Use Apple CD Test 1.1 on Macintosh Peripherals Test disk | | | | | | | |
| Drive Cards | Mac II PC Card | | | | | | • | IIcx | |
| | Mac SE-Bus PC Card | | • | | | | | | |
| Misc. Peripheral Devices | AppleFax Modem | Use FaxTest 1.2 on Macintosh Peripherals Test disk | | | | | | | |
| | AppleScanner | Use ScanTest 2.0 on Macintosh Peripherals Test disk | | | | | | | |
| | LaserWriter NT/NTX | Use NT/NTX ROM & SIMM Test 1.0 | | | | | | | |
| | ImageWriter LQ | Use PrintTest LQ 1.3 on Macintosh Peripherals Test disk | | | | | | | |
| Modems | Apple Data Modem 2400 | | | | | | | | |
| | Apple Portable Data Modem 2400 | Use ModemTest 1.0 on Macintosh Peripherals Test disk | | | | | | | |
| | Int'l XP 2400 | | | | | | | | |
| Network Cards | EtherTalk Interface Card | | | | | | • | 1.0 | |
| | EtherTalk NB Card | | | | | | • | 1.0 | 1.2 |
| | Apple Token- Talk NB Card | Use ConnectTest 1.0 on Macintosh Peripherals Test disk | | | | | | | |
| | Apple Coax/ Twinax Card | | | | | | | | |
| | Apple Serial NB Card | | | | | | | | |
| | LC Ethernet Card | | | | | | | | 1.2 |
| Input Devices | Keyboard Communication | | • | • | | | • | • | |
| | Mouse Communication | | • | • | | | • | • | • |
| | ADB Communication | | • | • | | • | • | • | • |



General Information

Diagnostics—SCSI Loopback Jumper

The SCSI loopback card must be jumpered between J1 pin 25 and RP1 pin 14 in order to be used with *MacTest*. New loopback cards have the jumper etched into the card circuitry. Older versions of the card need the jumper installed.

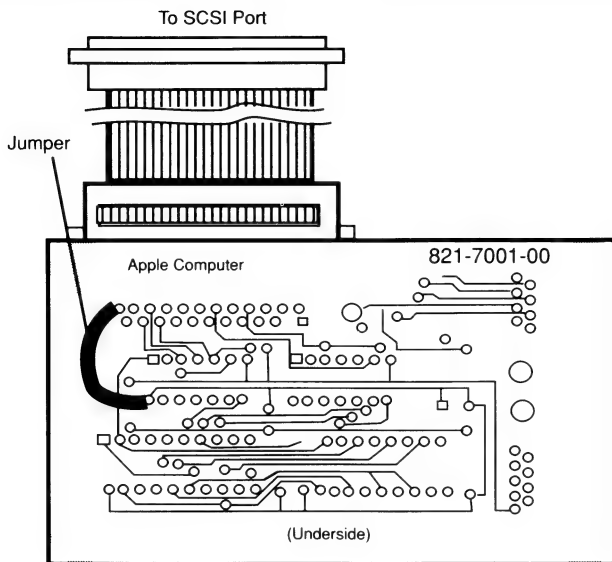


Figure: Older SCSI Loopback Card with Jumper

Determining If a Jumper Is Needed

1. Look at the part number on the back of the SCSI loopback card.
2. If the part number ends with the letter **A**, the jumper is included in the card circuitry.
3. If the part number ends with double zeros (**00**), check to see if the card has an external jumper installed from J1 pin 25 to RP1 pin 14. If there is no external jumper, install one.

Installing the Jumper

1. Locate J1 pin 25 and RP1 pin 14 on the SCSI loopback card (**see Figure**). J1 pin 25 is the pin closest to the upper-left corner of the card; RP1 pin 14 is in the middle line of pins and closest to the left edge of the card.
2. Solder a wire connection between J1 pin 25 and RP1 pin 14 on the SCSI loopback card.

General Information

Installation—HDA Drive Carrier



As a result of Apple's new carrierless drive strategy for the Macintosh Classic, Macintosh IIx, and Macintosh LC, you may need to install drive carriers on replacement HDA drive mechanisms. Proper installation requires using a torque driver (P/N 076-0390) to mount the carrier to the replacement drive, and following the procedure outlined below.

Installing the HDA Drive Carrier

1. Align the mounting carrier on the bottom of the new drive mechanism as shown in the figure below.
2. With the four lockwashers and Phillips screws removed from the faulty drive, loosely fasten the carrier to the drive. For the Macintosh IIx, use the screw hole marked **A**; for the Macintosh LC, use the screw hole marked **B** (see Figure).



CAUTION: Be sure to use the Phillips screws that you removed from the customer's faulty drive. Also be careful not to overtorque the screws and follow the torque sequence shown in the figure below. Failure to do so could damage the replacement drive.

3. **Following the sequences shown in the Figure below, torque the four Phillips screws to 8.0 in-lbs.**

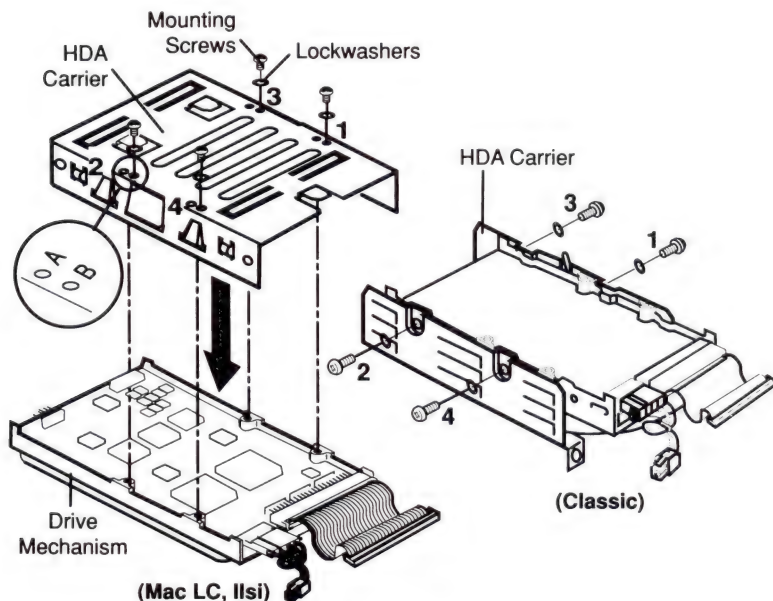


Figure: Installing the HDA Drive Carrier



General Information

Macintosh ADB Input Devices

This list includes all ADB input devices for the Macintosh SE, SE/30, II, IIfx, IICx, IICI, IIfx, IIsi, Classic, and LC computers, along with their part numbers.

| | |
|----------------------------------------------------|------------|
| Apple Keyboard | 661-0383 |
| Apple Keyboard, French Canadian | C661-0383 |
| Apple Keyboard, Spanish | E661-0383 |
| Apple Keyboard Parts | |
| Alps Locking Keyswitch | 970-1263 |
| Bottom Case | 815-1017 |
| Key Cap Set | 658-7011 |
| Keyboard Cable, 1 meter | 590-0361 |
| Keyboard Cable, 2 meter | 590-0152 |
| Keyswitch Set, ADB Kybd, Tan Plunger (Set of 10) | 076-0209 |
| Keyswitch Set, ADB Kybd, White Plunger (Set of 10) | 076-0387 |
| Top Case | 815-1016 |
| Apple Keyboard II | 661-0603 |
| Apple Keyboard II, Arabic* | AB661-0603 |
| Apple Keyboard II, British* | B661-0603 |
| Apple Keyboard II, Danish* | DK661-0603 |
| Apple Keyboard II, French* | F661-0603 |
| Apple Keyboard II, French Canadian | C661-0603 |
| Apple Keyboard II, German* | D661-0603 |
| Apple Keyboard II, Greek* | GR661-0603 |
| Apple Keyboard II, Hebrew* | HB661-0603 |
| Apple Keyboard II, Icelandic* | SK661-0603 |
| Apple Keyboard II, International* | Z661-0603 |
| Apple Keyboard II, Italian* | T661-0603 |
| Apple Keyboard II, Japanese | JA661-0603 |
| Apple Keyboard II, Korean | KH661-0603 |
| Apple Keyboard II, Norwegian* | H661-0603 |
| Apple Keyboard II, Portugese* | PO661-0603 |
| Apple Keyboard II, Persian* | PS661-0603 |
| Apple Keyboard II, Spanish* | Y661-0603 |
| Apple Keyboard II, Swedish* | S661-0603 |
| Apple Keyboard II, Swiss* | SF661-0603 |
| Apple Keyboard II, Taiwanese | TA661-0603 |
| Apple Keyboard II, Turkish* | TU661-0603 |
| Apple Keyboard II, Western Spanish | E661-0603 |
| Apple Keyboard II, Yugoslavian* | YU661-0603 |

***These keyboards are not available in the United States.**

| | |
|--------------------------------------------------|-----------|
| Apple Extended Keyboard | 661-0384 |
| Apple Extended Keyboard, French | F661-0384 |
| Apple Extended Keyboard, French Canadian | C661-0384 |
| Apple Extended Keyboard, German | D661-0384 |
| Apple Extended Keyboard, Italian | T661-0384 |
| Apple Extended Keyboard, Spanish | E661-0384 |
| Apple Extended Keyboard Parts | |
| Bottom Case | 815-1019 |
| Key Cap Set | 658-7010 |
| Keyboard Cable, 1 meter | 590-0361 |
| Keyswitch, Alps Locking | 970-1263 |
| Keyswitch Set, ADB Kybd, Tan Plunger (Set of 10) | 076-0209 |

continued...

General Information

Macintosh ADB Input Devices

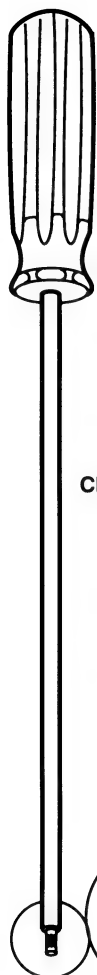


| | |
|--------------------------------------------------------------|------------|
| Keyswitch Set, ADB Kybd, White Plunger (Set of 10) | 076-0387 |
| Top Case | 815-1018 |
| Apple Extended Keyboard II | 661-0543 |
| Apple Extended Keyboard II, ISO, French | EF661-0544 |
| Apple Extended Keyboard II, ISO, French Canadian | EC661-0544 |
| Apple Extended Keyboard II, ISO, German | ED661-0544 |
| Apple Extended Keyboard II, ISO, Italian | ET661-0544 |
| Apple Extended Keyboard II, ISO, Spanish | EE661-0544 |
| Apple Extended Keyboard II Parts | |
| Bottom Case | 658-5211 |
| Foot, Front | 865-0057 |
| Foot, Rear, Adjustable | 865-1139 |
| Foot Pad, Rear | 865-0067 |
| Key Cap Set | 658-7010 |
| Keyboard Cable, 1 meter | 590-0361 |
| Keyswitch, Alps Locking | 970-1263 |
| Keyswitch Set, ADB Kybd, Tan Plunger (Set of 10) | 076-0209 |
| Keyswitch Set, ADB Kybd, White Plunger (Set of 10) | 076-0387 |
| Spring, Foot Return | 870-0030 |
| Template | 001-0017 |
| Top Case | 658-5210 |
| Apple ISO Keyboard, French | F661-0454 |
| Apple ISO Keyboard, German | D661-0454 |
| Apple ISO Keyboard, Italian | T661-0454 |
| Mouse, ADB (replaced by 661-0479) | 661-0338 |
| Mouse Ball (25.4 mm dia), gray | 699-8001 |
| Mouse Ball (21.9 mm dia), black | 699-8038 |
| Retainer, ADB Mouse (38 mm dia) | 076-0231 |
| Retainer, ADB Mouse (34 mm dia) | 815-0816 |
| Mouse, ADB (replacing part number 661-0338) | 661-0479 |
| Mouse Ball | 815-1135 |
| Retainer, ADB Mouse | 815-1136 |



General Information

Special Tools Index

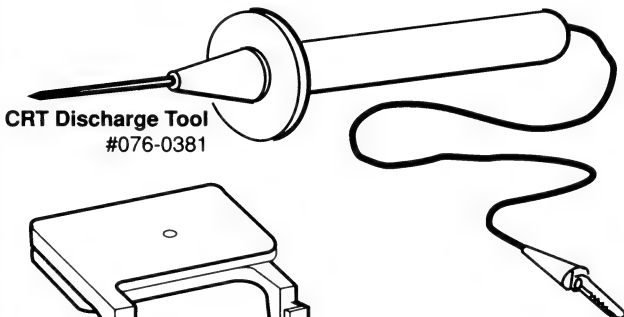
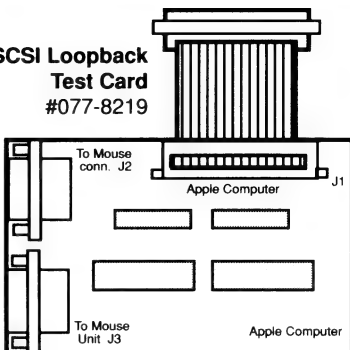


Torx Driver
#076-8053

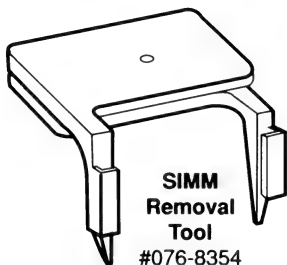


DB9 Serial Port Plug
(Set of 2) #077-8129

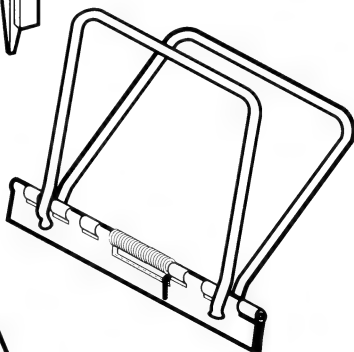
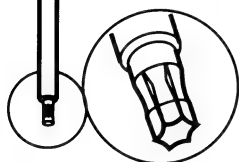
SCSI Loopback Test Card
#077-8219



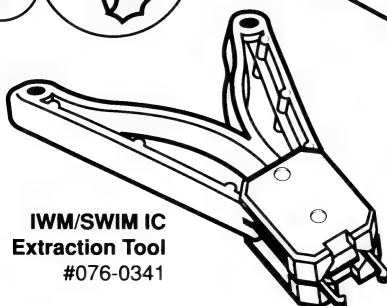
CRT Discharge Tool
#076-0381



SIMM Removal Tool
#076-8354



Pull-Apart Tool
#076-8059



IWM/SWIM IC Extraction Tool
#076-0341



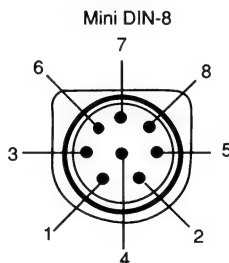
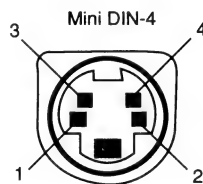
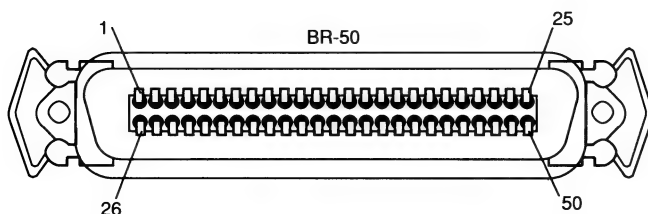
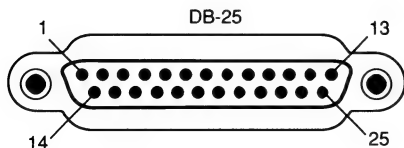
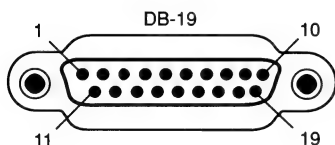
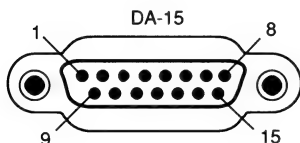
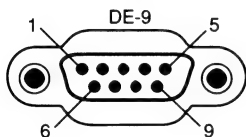
Contents

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| Cable Connectors | 1 |
| Peripheral Cables | 2 |
| Table of Peripheral Cables | 3 |
| Computer Port Locations | 4-5 |
| Pin-Outs—Computer Ports | 6-14 |

Cable Connectors

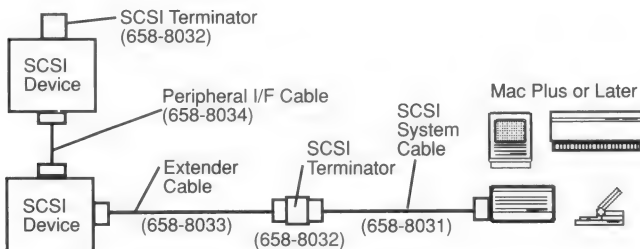
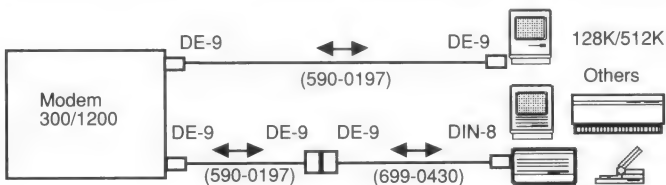
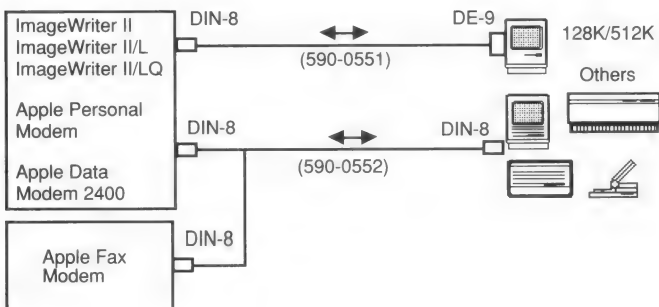
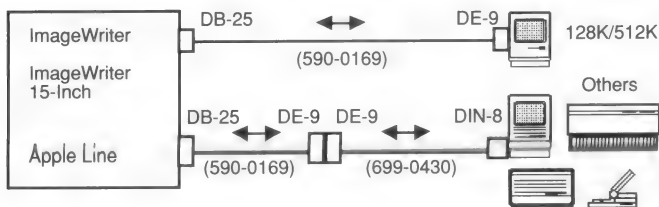
The pin numbers shown below are for the connectors attached to the ends of the Macintosh peripheral cables, as viewed from the front of the connector.





Ports and Cables

Peripheral Cables



Ports and Cables

Table of Peripheral Cables



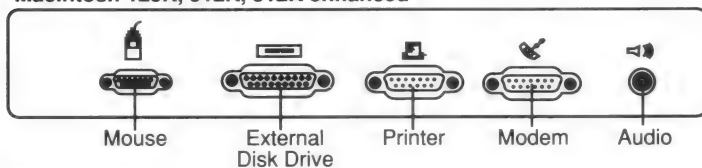
| | Service Part # | | Cable Information | | |
|----------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------|-------------------|--------------------|-----------------------------------------------------------------|
| | Macintosh 128K/512K | Macintosh Plus and Later | Model # | Color | Type |
| ImageWriter®, ImageWriter 15-Inch, AppleLine™, Cluster Controller | 590-0169 | 590-0169 | M0150 | Medium Brown | DE-9 to DB-25 Male to Male |
| | | and 699-0430 590-0553 or 590-0341 | M0199 | Smoke | Mini DIN-8 to Mini DE-9 Male to Female (adapter cable) |
| | | | M0189 | Beige | |
| ImageWriter II, II/L, & II/LQ; Apple Personal Modem & Apple Data Modem 2400 | 590-0551 or 590-0332 | | M0196 | Smoke | Mini DIN-8 to DE-9 Male to Male |
| | | | M0185 | Beige | |
| | | 590-0552 or 590-0340 | M0197 | Smoke Beige | Mini DIN-8 to Mini DIN-8 Male to Male |
| AppleFax™ Modem | | 590-0552 or 590-0340 | M0197 | Smoke Beige | Mini DIN-8 to Mini DIN-8 Male to Male |
| Modem 300/1200 | 590-0197 | 590-0197 | M0170 | Medium Brown | DE-9 to DE-9 Male to Male |
| | | and 699-0430 590-0553 or 590-0341 | M0199 | Smoke | Mini DIN-8 to Mini DE-9 Male to Female (adapter cable) |
| | | | M0189 | Beige | |
| SCSI Devices (system cable) | | 658-8031 590-0305 or 590-0345 | M0206 | Smoke Beige | BR-50 to DB-25 Male to Male |
| SCSI Devices (terminator) | | 658-8032 590-0304 or 590-0344 | M0209 | Smoke Beige | BR-50 |
| SCSI Devices (cable extender) | | 658-8033 590-0307 or 590-0347 | M0208 | Smoke Beige | BR-50 Male to Female |
| SCSI Devices (peripheral I/F cable) | | 658-8034 590-0306 or 590-0346 | M0207 | Smoke Beige | BR-50 Male to Male |



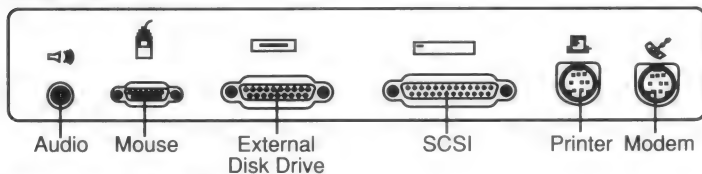
Ports and Cables

Computer Port Locations

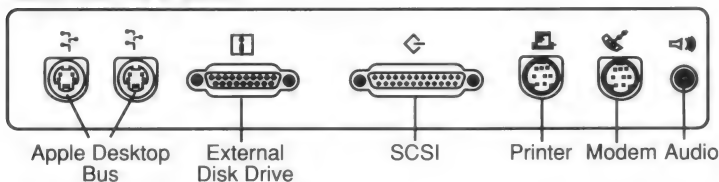
Macintosh 128K, 512K, 512K enhanced



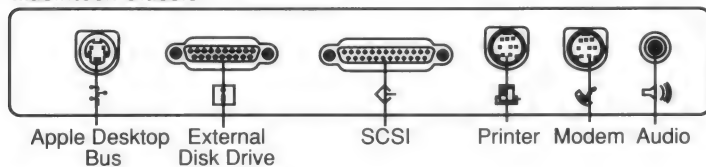
Macintosh Plus



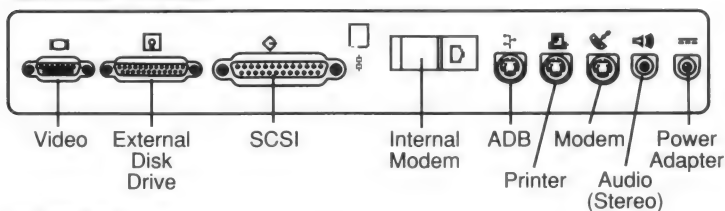
Macintosh SE & SE/30



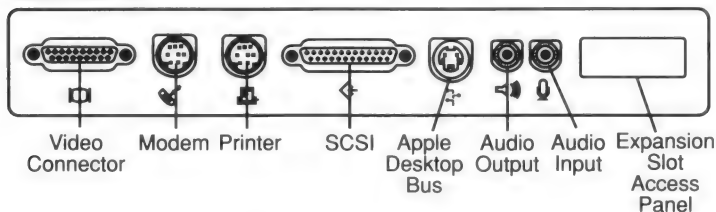
Macintosh Classic



Macintosh Portable



Macintosh LC

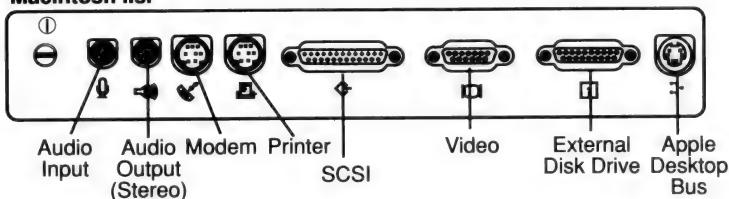


Ports and Cables

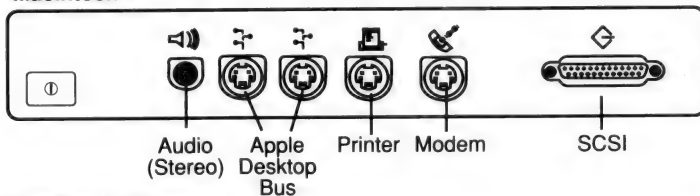
Computer Port Locations



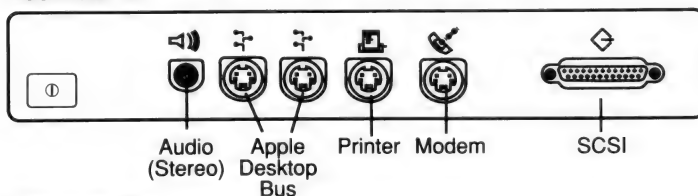
Macintosh IIsi



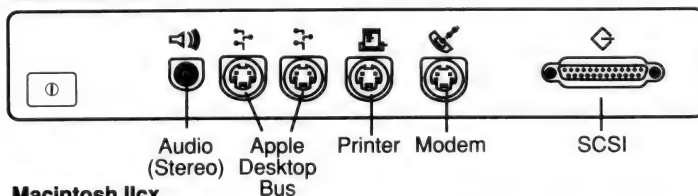
Macintosh II



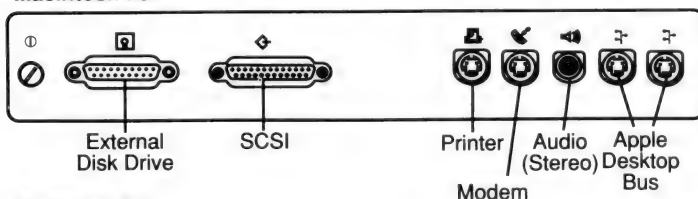
Macintosh IIfx



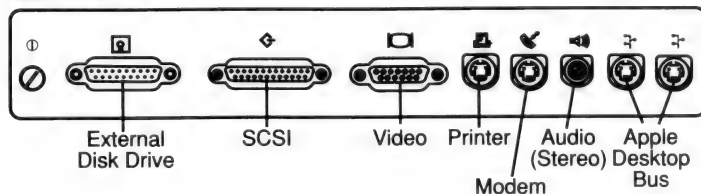
Macintosh IIcx



Macintosh IIcx



Macintosh IIfx





Ports and Cables

Pin-Outs—Computer Ports

This section contains the specifications for all the built-in interfaces and interface card connectors for the Macintosh family of computers. Built-in interfaces are covered first, followed by interface cards. Illustrations on the previous two pages show the locations of the built-in interface connectors.

Note: The connector specified is for the cable end, not the computer port. A slash (/) after the signal name indicates that the signal is valid when the signal is low.

Keyboard Connector

| Pin | Signal | Signal Description |
|-----|--------|-------------------------------|
| 1 | GND | Ground |
| 2 | CLOCK | Keyboard clock (input to VIA) |
| 3 | DATA | Serial data line |
| 4 | +5V | +5 volts |

This RJ-11 connector is present on the Macintosh 128K/512K/512K enhanced, and Plus.

Ports and Cables

Pin-Outs—Computer Ports



Mouse Connector

| Pin | Signal | Signal Description |
|-----|--------|---------------------------------------|
| 1 | GND | Signal ground |
| 2 | +5V | +5 volts |
| 3 | GND | Signal ground |
| 4 | X2 | Left-to-right motion indicator |
| 5 | X1 | Interrupt line (left-to-right motion) |
| 6 | NC | No connection |
| 7 | SW | Mouse button |
| 8 | Y2 | Up-down motion indicator |
| 9 | Y1 | Interrupt line (up-down motion) |

This male DE-9 connector is present on the Macintosh 128K, 512K, 512K enhanced, and Plus.

Apple Desktop Bus Connector

| Pin | Signal | Signal Description |
|-----|-----------|------------------------------------------------------------------------|
| 1 | Data | Bidirectional data bus |
| 2 * | Power On/ | Signal momentarily grounded to pin 4 to begin power-up sequence in CPU |
| 3 | Power | +5 volts |
| 4 | Ground | Signal ground |

The ADB connector (Mini DIN-4 male) is present on the entire Macintosh family of computers except the Macintosh 128K, 512K, 512K enhanced, and Plus.

* Pin 2 is used on Macintosh II family computers only.



Ports and Cables

Pin-Outs—Computer Ports

External Disk Drive Connector

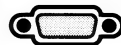
| Pin | Signal | Signal Description |
|-----|--------|----------------------|
| 1 | GND | Signal ground |
| 2 | GND | Signal ground |
| 3 | GND | Signal ground |
| 4 | GND | Signal ground |
| 5 | -12V | -12 volts DC |
| 6 | +5V | +5 volts DC |
| 7 | +12V | +12 volts DC |
| 8 | +12V | +12 volts DC |
| 9 | NC | No connection |
| 10 | PWM | Motor speed control |
| 11 | PH0 | Command control line |
| 12 | PH1 | Command control line |
| 13 | PH2 | Command control line |
| 14 | PH3 | Command control line |
| 15 | WRREQ/ | Write request |
| 16 | HDSEL | Head select |
| 17 | ENBL2/ | Read line enable |
| 18 | RD | Read data |
| 19 | WR | Write data |

This male DB-19 connector is present on all Macintosh computers except the Macintosh II, IIx, IIcx, and LC. The external disk drive connects the following:

- 400K external drive to Macintosh 128K, 512K, 512K enhanced, Plus, SE, and Portable
- 800K/Apple 3.5 Drive to Macintosh 512K enhanced, Plus, SE, SE/30, Classic, IIcx, IIci, IIsi, and Portable
- FDHD SuperDrive to Classic, SE/30, IIcx, IIci, IIsi, Portable, and upgraded Macintosh SE
- Apple Hard Disk 20 to Macintosh 512K, 512K enhanced, Plus, and SE.

Ports and Cables

Pin-Outs—Computer Ports



Modem/Printer Connectors (DE-9)

Signal Name RS-422

| Pin | Signal | Signal Description |
|-----|--------|--------------------|
| 1 | GND | Signal ground |
| 2 | +5V | +5 volts |
| 3 | GND | Signal ground |
| 4 | TxD+ | Transmit Data + |
| 5 | TxD- | Transmit Data - |
| 6 | +12V | +12 volts |
| 7 | HSKi | Handshake Input |
| 8 | RxD+ | Receive Data + |
| 9 | RxD- | Receive Data - |

This male DE-9 connector is present on the Macintosh 128K, 512K, and 512K enhanced.

Modem/Printer Connectors (DE-9)

Signal Name RS-232

| Pin | Signal | Signal Description |
|-----|--------|--------------------|
| 1 | FG | Frame ground |
| 2 | NC | No connection |
| 3 | SG | Signal ground |
| 4 | NC | No connection |
| 5 | TxD | Transmit Data |
| 6 | NC | No connection |
| 7 | DSR | Data Set Ready |
| 8 | NC | No connection |
| 9 | RxD | Receive Data |

This male DE-9 connector is present on the Macintosh 128K, 512K, and 512K enhanced.



Ports and Cables

Pin-Outs—Computer Ports

Modem/Printer Connectors (DIN-8)

| Pin | Signal | Signal Description |
|-----|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | HSKo | Handshake output; connected to SCC Data Terminal Ready |
| 2 | HSKi | Handshake input; connected to SCC Clear To Send and Transmit/Receive Clock |
| 3 | TxD- | Transmit Data (inverted); connected to SCC Transmit Data; tri-stated when Request To Send is deasserted |
| 4 | SG | Signal ground; connected to logic and chassis ground |
| 5 | RxD- | Receive Data; connected to SCC Receive Data |
| 6 | TxD+ | Transmit Data; connected to SCC Transmit Data; tri-stated when Request To Send is deasserted |
| 7 | GPI | General-Purpose input; connected to SCC Data Carrier Detect (or to Receive/Transmit Clock if the VIA1 SYNC signal is high). Not connected on the Macintosh Plus, Classic, LC, or IIsi. |
| 8 | RxD+ | Receive Data; connected to the SCC Receive Data |

These Mini DIN-8 (male) connectors are present on all Macintosh computers except the Macintosh 128K/512K/512K enhanced. To connect DE-9 cables to the Mini DIN-8 port, use adapter cable 590-0341 (beige) or 590-0553/699-0430 (smoke).

Ports and Cables

Pin-Outs—Computer Ports



Audio Input Connector

| Pin | Signal | Signal Description |
|----------|--------|---------------------------------------------------------------------|
| (Sleeve) | GND | Signal ground |
| (Tip) | +8V | +8 volts for powering electret microphone |
| (Ring) | Right | Audio input with a maximum amplitude of 20 MV at 600 ohms impedance |

This stereo, miniature phono plug is present on the Macintosh LC and IIsi.

Audio Output Connector—Monaural

| Pin | Signal | Signal Description |
|----------|--------|-----------------------------------|
| (Sleeve) | GND | Signal ground |
| (Tip) | AUDIO | .5-volt peak-to-peak audio signal |

This monaural, miniature phono plug is present on the Macintosh 128K/512K/512K enhanced, Plus, and SE. The internal speaker is disabled when this connector is being used.

Audio Output Connector—Stereo

| Pin | Signal | Signal Description |
|----------|--------|-------------------------------------------------------------------------------|
| (Sleeve) | GND | Signal ground |
| (Tip) | Left | 1-volt peak-to-peak audio signal with an impedance of 47 ohms*; left channel |
| (Ring) | Right | 1-volt peak-to-peak audio signal with an impedance of 47 ohms*; right channel |

This stereo, miniature phono plug is present on all Macintosh computers except the Macintosh 128K/512K/512K enhanced, Plus, and SE. The internal speaker is disabled when this connector is being used.

* The Macintosh Portable produces a 0.75-volt peak-to-peak signal.



Ports and Cables

Pin-Outs—Computer Ports



CAUTION: The SCSI interface uses the same type of connector as a standard RS-232 serial interface, but is electrically very different. **DO NOT** connect any RS-232 device or cable to this connector. Doing so can result in damage to both the device and the computer.

SCSI Connector

| Pin | Signal | Signal Description |
|-----|---------|-------------------------------|
| 1 | REQ/ | Request |
| 2 | MSG/ | Message |
| 3 | I/O/ | Input/output |
| 4 | RST/ | Reset |
| 5 | ACK/ | Acknowledge |
| 6 | BUSY/ | Busy |
| 7 | GND | Signal ground |
| 8 | Data0/ | Data bit 0 |
| 9 | GND | Signal ground |
| 10 | Data3/ | Data bit 3 |
| 11 | Data5/ | Data bit 5 |
| 12 | Data6/ | Data bit 6 |
| 13 | Data7/ | Data bit 7 |
| 14 | GND | Signal ground |
| 15 | C/D/ | Control/data |
| 16 | GND | Signal ground |
| 17 | ATN/ | Attention |
| 18 | GND | Signal ground |
| 19 | SEL/ | Select |
| 20 | PARITY/ | Data parity |
| 21 | Data1/ | Data bit 1 |
| 22 | Data2/ | Data bit 2 |
| 23 | Data4/ | Data bit 4 |
| 24 | GND | Signal ground |
| 25 | TERMPRW | +5 volts (terminator power) * |

This male DB-25 connector is on all Macintosh computers except the Macintosh 128K, 512K, and 512K enhanced.

* Terminator power is not provided on the Macintosh Plus.

Ports and Cables

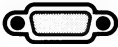
Pin-Outs—Computer Ports



External Video Connector

| Pin | Signal | Signal Description |
|-------|-------------|----------------------------------|
| 1 | RED.GND | Red video ground |
| 2 | RED.VID | Red video |
| 3 | CSYNC/ | Composite sync |
| 4 | MON.ID1 | Monitor ID, bit 1 |
| 5 | GRN.VID | Green video |
| 6 | GRN.GND | Green video ground |
| 7 | MON.ID2 | Monitor ID, bit 2 |
| 8 | NC | No connection |
| 9 | BLU.VID | Blue video |
| 10 | MON.ID3 | Monitor ID, bit 3 |
| 11 | C&VSYNC GND | Composite & vertical sync ground |
| 12 | VSNC/ | Vertical sync |
| 13 | BLU.GND | Blue video ground |
| 14 | HSYNC.GND | Horizontal sync ground |
| 15 | HSYNC/ | Horizontal sync |
| Shell | CHASSIS GND | Chassis ground |

This DA-15 connector is present on the Macintosh LC, Ilci, and IIsi. This video connector supports all Apple Macintosh monitors except the Two-Page Display.



Ports and Cables

Pin-Outs—Computer Ports

External Video Connector—Portable

| Pin | Signal | Signal Description |
|-----|--------------|-------------------------------------|
| 1 | FPDATA(0) | Flat panel display data bus (bit 0) |
| 2 | FPDATA(1) | Flat panel display data bus (bit 1) |
| 3 | +5V | +5 volts DC |
| 4 | FPDATA(2) | Flat panel display data bus (bit 2) |
| 5 | FPDATA(3) | Flat panel display data bus (bit 3) |
| 6 | FPDATA(4) | Flat panel display data bus (bit 4) |
| 7 | GND | Ground |
| 8 | +5V | +5 volts DC |
| 9 | GND | Ground |
| 10 | FPDATA(5) | Flat panel display data bus (bit 5) |
| 11 | FPDATA(6) | Flat panel display data bus (bit 6) |
| 12 | FPDATA(7) | Flat panel display data bus (bit 7) |
| 13 | BATT_VOLTAGE | Direct connect to main battery |
| 14 | FLM | Flat panel new frame sync |
| 15 | CL2/ | Flat panel display data clock |

The external video connector for the Macintosh Portable is a male DA-15 connector. This connector does not support monitors directly; an interface adaptor is required to connect an external monitor to this video port on the Macintosh Portable.



Service Guide—Macintosh® Computers

March 1991

Apple Phone Numbers

Credits

Apple Technical Assistance Center

408-879-0220

Customer Service Administration

408-559-6444

Service Account # (Filled in by service provider)

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Send your Comments and Suggestions to:

Applelink: ASG

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Apple Service Guide for Macintosh Computers

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